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AUTHOR	Pitcher, Barbara
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ABSTRACT

This report is primarily a summary of the results of validity studies carried out by the Educational Testing Service for graduate schools of business during the 3 years of the Admission Test for Graduate Study in Business (ATGSB) Validity Study Service. The report covers 69 studies carried out for 67 graduate schools of business in the period from academic year 1967-68 through 1969-70.

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Report of Validity Studies Carried Out by ETS for Graduate Schools of Business 1954 - 1970

Prepared by
Barbara Pitcher

Division of Analytical
Studies and Services

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Princeton, New Jersey—Berkeley, California

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Introduction

This report is primarily a summary of the results of validity studies carried out by Educational Testing Service for graduate schools of business during the three years of the ATGSB Validity Study Service. It also includes a historical summary of results of validity studies carried out by ETS prior to the ATGSB Validity Study Service.

The ATGSB Validity Study Service was instituted in 1967-68 as a three-year program to carry out validity studies for all graduate schools of business that required the ATGSB, wished to participate in the service, and could provide usable data. Copies of letters describing the service and of materials used for data collection are included in this report in Appendix A. During the three years of the service formal studies were carried out for 67 graduate schools of business, 26 in 1967-68, 26 in 1968-69, and 15 in 1969-70. A few informal studies were also carried out during this period and in 1970-71, for schools that could not provide enough data for a formal study during the three-year period. The summary given in this report is based on the formal studies only.

Plan of the Studies

A uniform pattern for all of the studies was followed. In all instances first-year average grades in graduate schools of business were the criterion against which the ATGSB scores (Total, Verbal, and Quantitative) and undergraduate record (UGR) were validated. The mean ATGSB Total score for all candidates from each student's undergraduate college was also used routinely as a predictor. In the reports this variable was labeled CES (Candidate Excellence by School) Index and resulted from assigning to each student the mean ATGSB Total score for all candidates (1957-1965 in the first two years of the service and 1957-1968 in the third year) from his undergraduate college. If a student's undergraduate college was not listed in the ATGSB Statistical Summary by Undergraduate College Attended, his own ATGSB Total score was used.

In the individual school validity studies, the inclusion of one additional predictor was also permitted; however, results on the optional predictors are excluded from this summary report because the optional predictors differ from one school to another and the results do not permit generalization across schools.

Customary correlational and regression methods were used to study the effectiveness of each predictor alone and in combinations, for predicting the criterion first-year averages in graduate schools of business. From the various possible combinations that could be produced from the five predictors, four were selected for study. These four combinations are: 1) UGR and ATGSB Total; 2) UGR, ATGSB Verbal, and ATGSB Quantitative; 3) UGR, ATGSB Total, and CES Index; and 4) UGR, ATGSB Verbal, ATGSB Quantitative, and CES Index. These combinations are probably the ones of most practical use to admissions officers. All four combinations include UGR, since it is expected that the test scores would never be used alone for admissions purposes but would be used in combination with undergraduate record.

Appendix B of this report contains copies of Sections I and III, the common material used in the individual reports for all schools. The version given in the appendix is the one used in 1969-70, which contains some revisions and is slightly different from the versions used in the first two years of the service. Section II, the unique section of each report, presented each school's own results, generally including a summary table of validity coefficients for each predictor used alone and in selected combinations, a prediction table based on the prediction of first-year average grades from the combination of undergraduate record and ATGSB Total scores, an expectancy table to be used with the prediction table, an intercorrelation table, with means and standard deviations, based on all variables, and regression equations based on four selected combinations of predictors as follows: UGR and ATGSB Total; UGR, ATGSB

Verbal, and ATGSB Quantitative; UGR, ATGSB Total, and CES Index; and UGR, ATGSB Verbal, ATGSB Quantitative, and CES Index. These results were based on pooled data for two or more entering classes. If a school had enough data so that two classes of 85 or more students each could be assembled, a cross-validation procedure was used and summary results of the cross-validation were also presented in the unique section of the report.

General Summary

The summary given in this report covers 69 studies carried out for 67 graduate schools of business in the three-year period from 1967-68 to 1969-70. (There are 69 studies summarized because two schools sent enough data so that separate studies for day and evening students could be carried out. For most schools that had day and evening students the two groups were combined.)

The basic validity coefficients resulting from the 69 studies are summarized in Figures 1, 2, and 3. In these figures each dot represents the validity coefficient for the indicated predictor or combination of predictors for one business school group. The arrows represent the median values. Wherever combinations of predictors are indicated the shrunken multiple correlations were used and indeterminate values were plotted as if they had been zero.

Figure 1 summarizes results concerning the effectiveness of undergraduate record (UGR) alone, ATGSB Total alone, and the two predictors combined, for predicting first-year average grades for the 69 groups of students at 67 graduate schools of business. The figure shows clearly that the combination of UGR and ATGSB Total is generally more effective than either of the two predictors used alone. The combination has a median coefficient of .35 compared with .23 for UGR alone and .25 for ATGSB Total alone.

Figure 2 summarizes results for UGR, ATGSB Verbal and ATGSB Quantitative. Here again, the combination of predictors is noticeably more effective for pre-

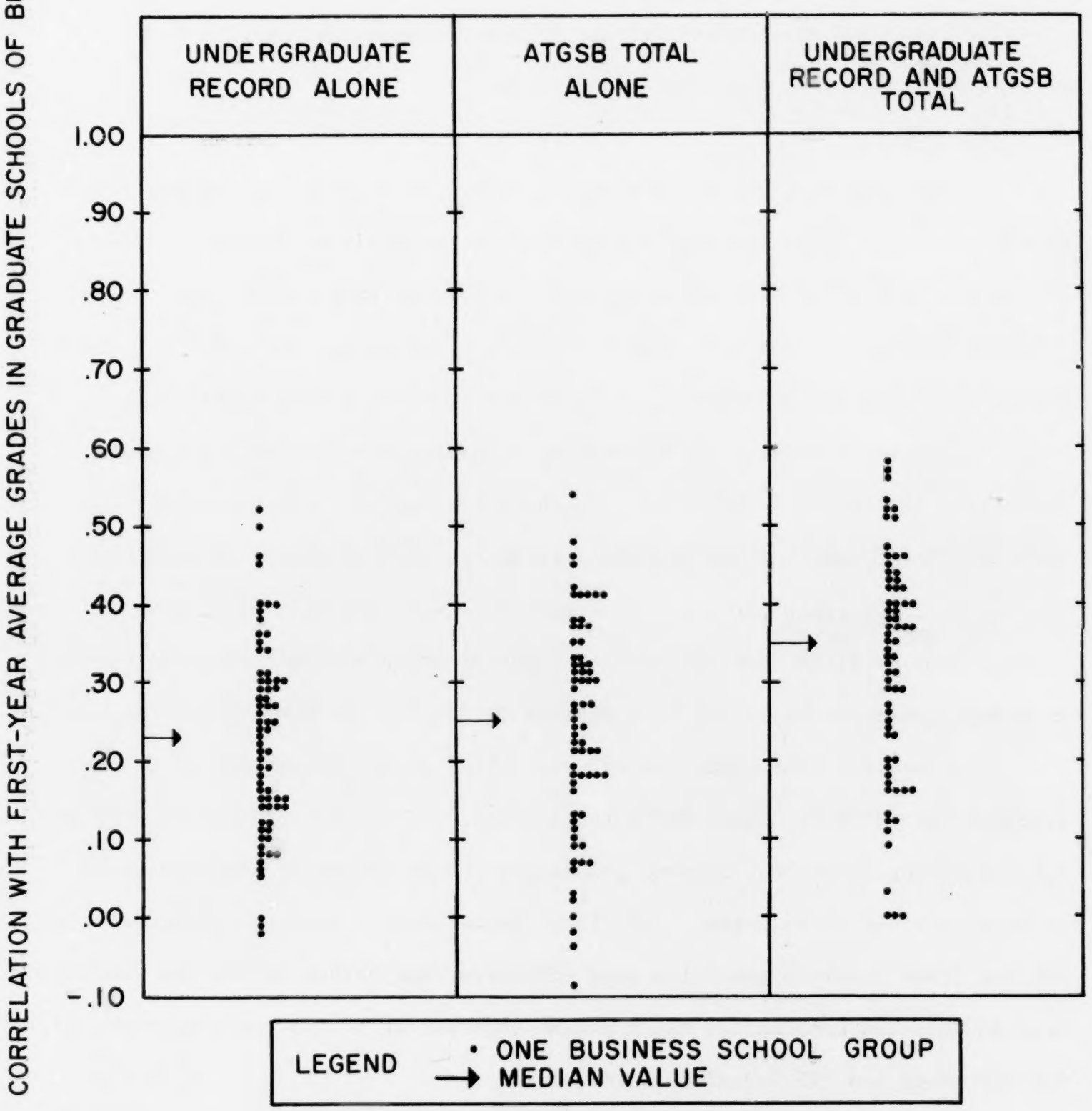


FIGURE 1. Validity coefficients for undergraduate record alone, ATGSB Total alone, and undergraduate record and ATGSB Total combined. (Based on 69 studies conducted in 1967-68--1969-70 for 67 graduate schools of business.)

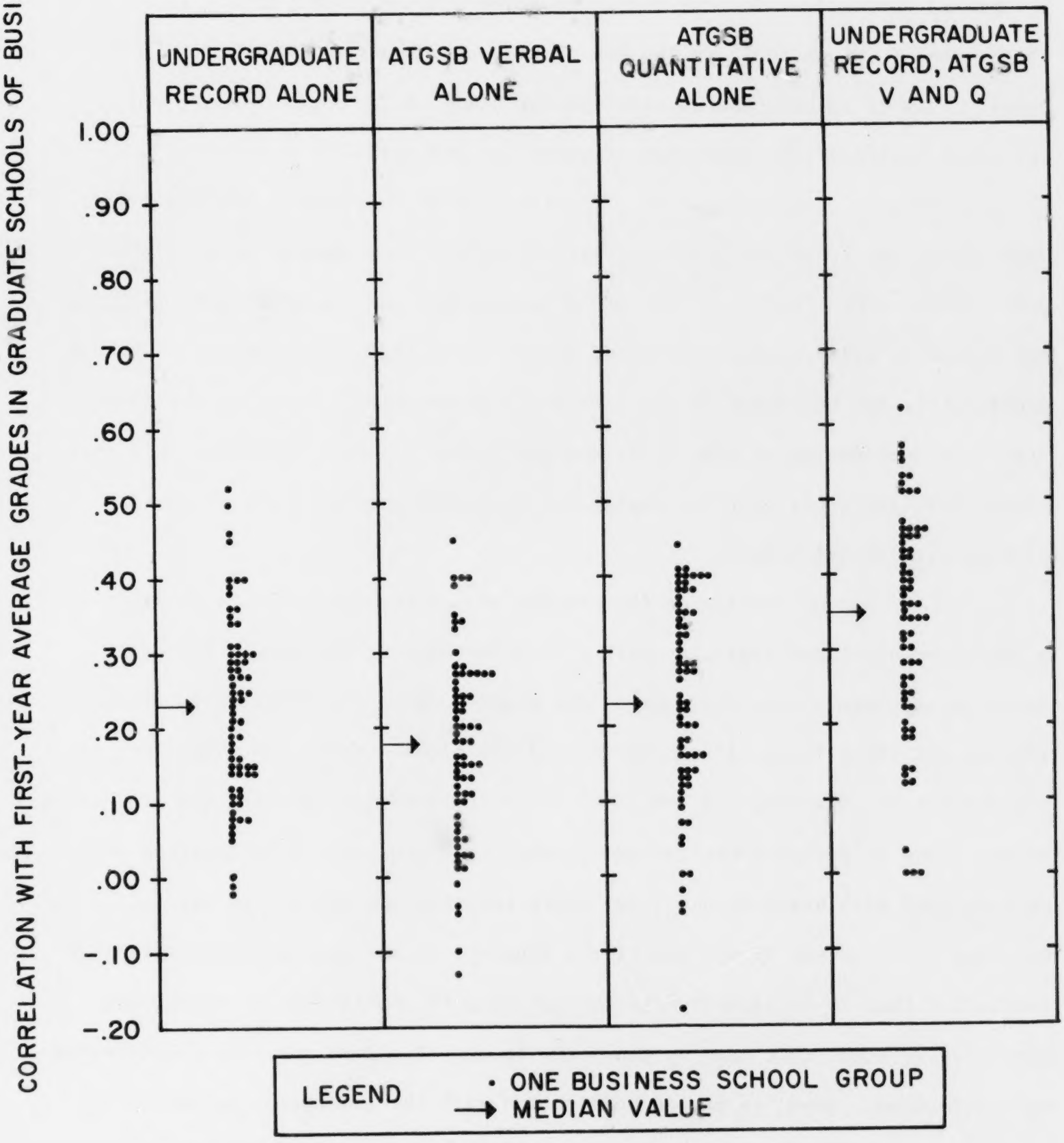


FIGURE 2. Validity coefficients for undergraduate record alone, ATGSB Verbal scores alone, ATGSB Quantitative scores alone, and undergraduate record and ATGSB Verbal and Quantitative scores combined. (Based on 69 studies conducted in 1967-68--1969-70 for 67 graduate schools of business.)

dicting first-year average grades than is any of the predictors used alone. The median coefficient for the three-predictor combination of UGR, V, and Q is the same (.35) as that for the two-predictor combination of UGR and ATGSB Total. This is to be compared with .23 for UGR, .18 for ATGSB Verbal, and .23 for ATGSB Quantitative, when each of these is used alone.

Figure 3 is designed to call attention to the results for CES Index. Used alone, CES Index has a median coefficient of .17 (compared with .23 for UGR, .25 for ATGSB Total, .18 for ATGSB Verbal, and .23 for ATGSB Quantitative). The median validity coefficient based on the three-predictor combination of UGR, ATGSB Total, and CES Index is the same (.37) as the median based on the four-predictor combination of UGR, V, Q, and CES Index. In both instances this is a slight increase (.02) over the median for the corresponding combination of predictors without CES Index.

One way of looking at the results of the studies would be to ask a series of questions beginning with a consideration of the predictive effectiveness obtainable from UGR alone. One might compare the predictive effectiveness of ATGSB Total alone with that of UGR alone. Next, one would look at the results of combining UGR and ATGSB Total compared with the results from using either alone to see what was gained by combining them. The next question would be concerned with breaking the Total score into its two parts - Verbal and Quantitative - to see if the use of the separate scores produces more effective prediction than is obtainable from the preassigned combination of verbal and quantitative items that make up the Total score. The last question is concerned with CES Index. Does its use in combination with the undergraduate record and test scores (either the Total score or the Verbal and Quantitative scores) improve prediction?

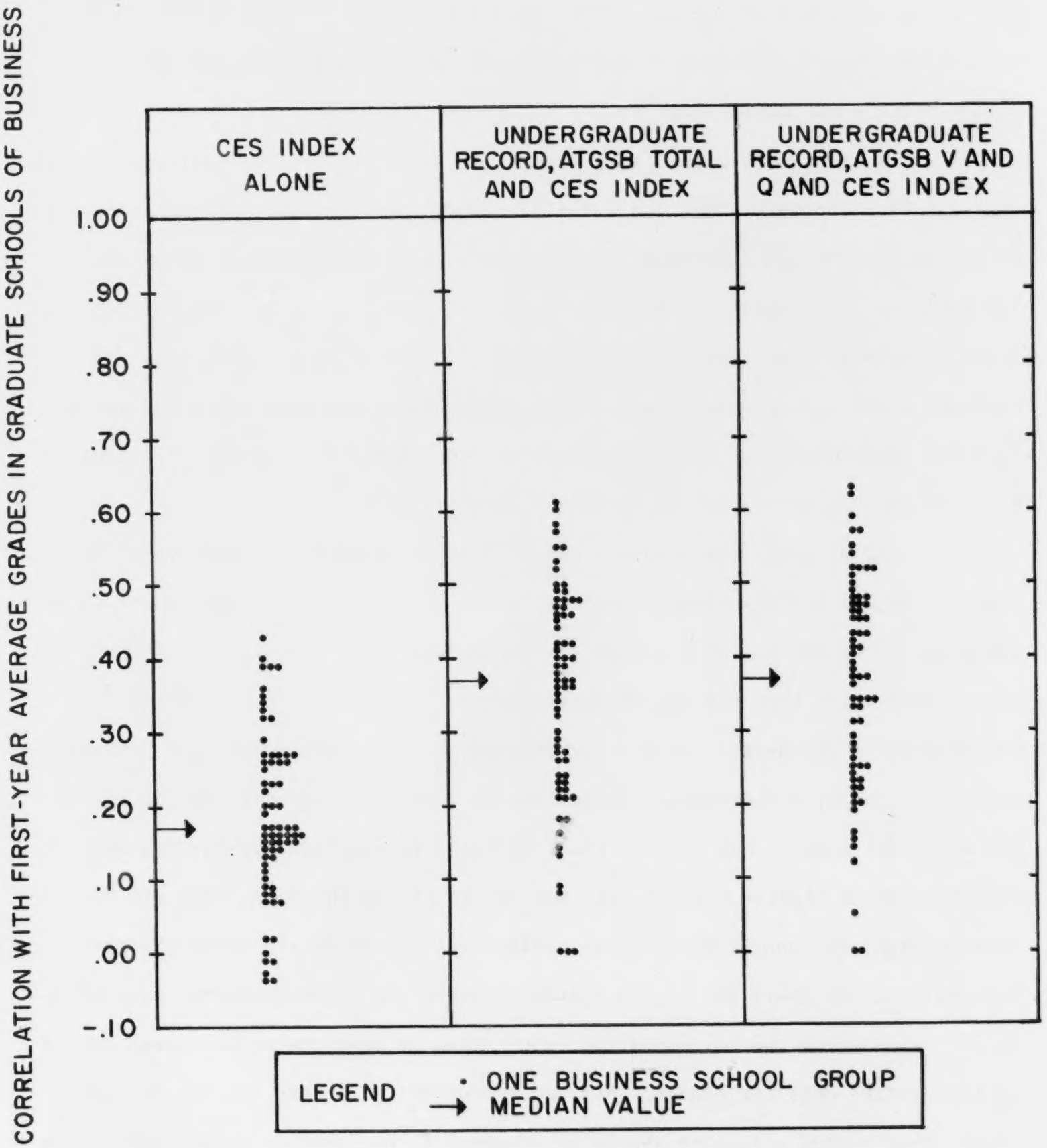
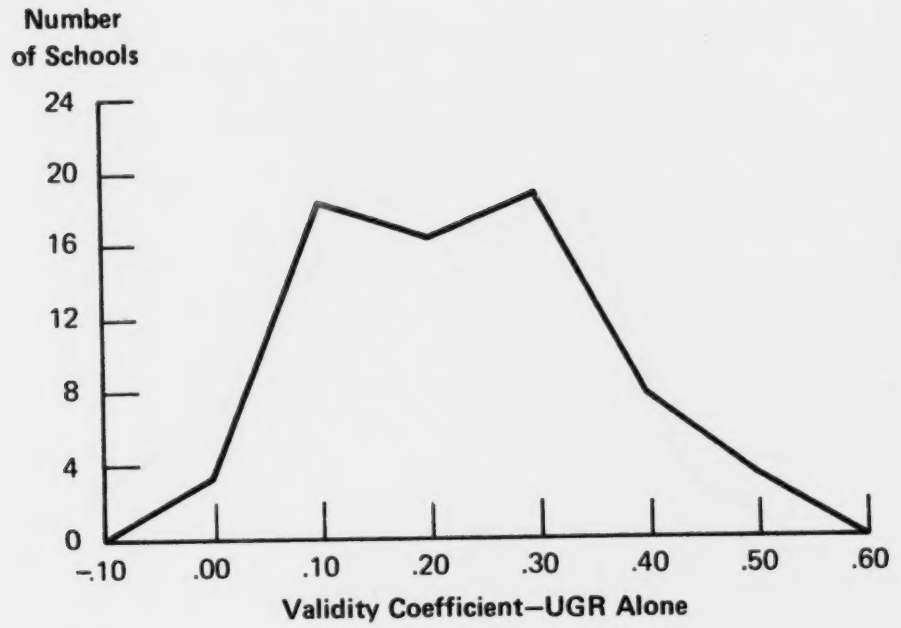


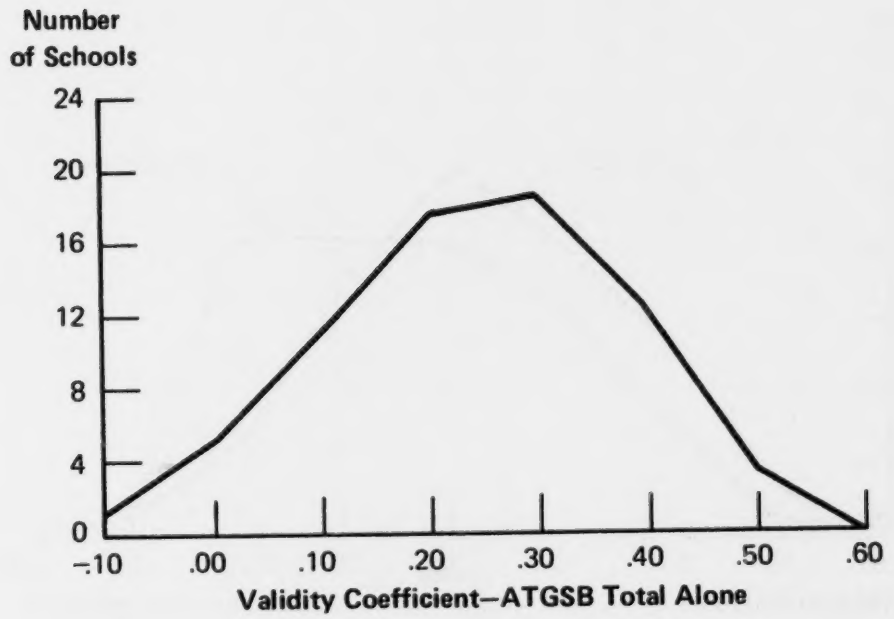
FIGURE 3. Validity coefficients for CES Index alone, undergraduate record, ATGSB Total and CES Index combined and undergraduate record, ATGSB Verbal and Quantitative and CES Index combined. (Based on 69 studies conducted in 1967-68--1969-70 for 67 graduate schools of business.)

Figures 4, 5, and 6 are repeated from the brief, summarized version of this report prepared in October, 1971. They present the results of the validity studies in a manner that will facilitate study of the above questions in a somewhat different manner from Figures 1, 2, and 3.

Figure 4 is designed to compare the distribution of validity coefficients obtained from the 69 studies for UGR alone, ATGSB Total alone, and the combination of the two. Although individual school results vary considerably, as shown by the range of coefficients from -.10 to .60, there is a general trend for UGR and ATGSB Total when used alone to be about equally effective, but when they are combined there is a general trend toward improvement in prediction. The median validity coefficient for the combination of UGR and ATGSB Total is .35, compared with .23 for UGR alone and .25 for ATGSB Total alone.

Figure 5 is like Figure 4 except that it results from the use of the separate Verbal and Quantitative scores in place of the Total. The answer to the question, "Does the use of the separate Verbal and Quantitative scores result in better prediction than the use of Total scores, in combination with UGR?", is not clearcut. The median validity coefficient for the three-predictor combination of UGR, V, and Q is the same (.35) as that for the two-predictor combination of UGR and ATGSB Total. The distributions of validity coefficients for the two combinations in Figures 4 and 5 (the bottom one of the three, in each figure) show a slight tendency toward higher coefficients based on the three-predictor combination, but there are enough instances where the three-predictor combination is not better than the two-predictor combination so that the median based on all of the studies does not change. For any school which has had its own validity study, that school's results should be examined to see whether it was one of the schools where the use of UGR, V, and Q did produce a noticeably higher validity coefficient than did the easier-to-use combination of UGR and ATGSB Total or





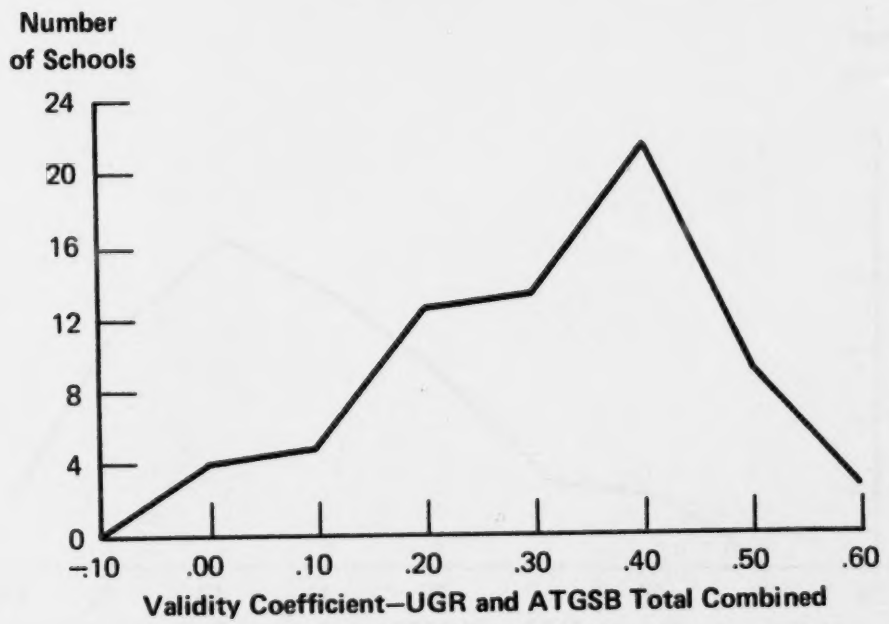
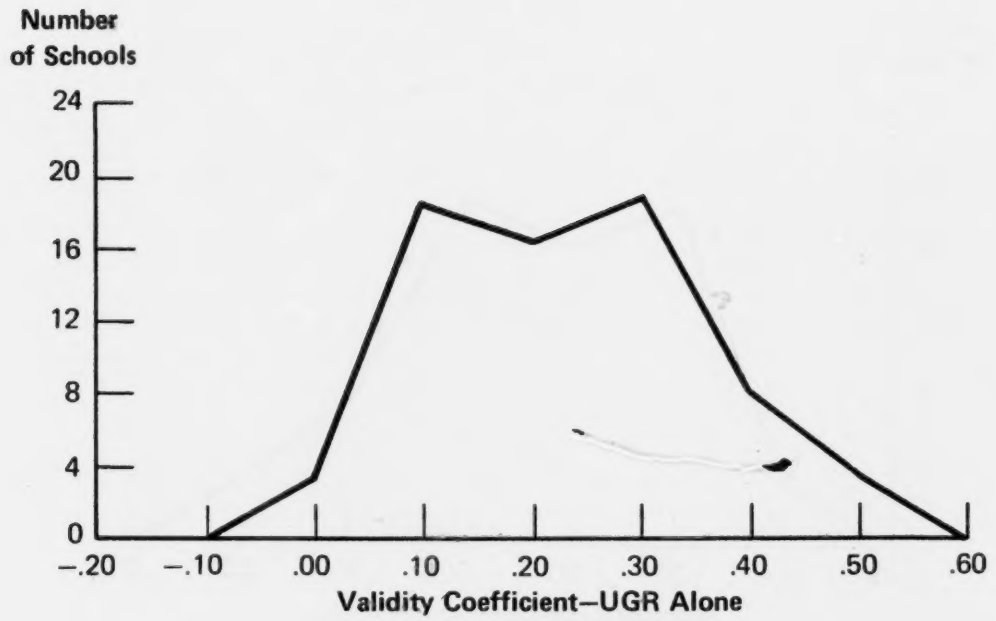
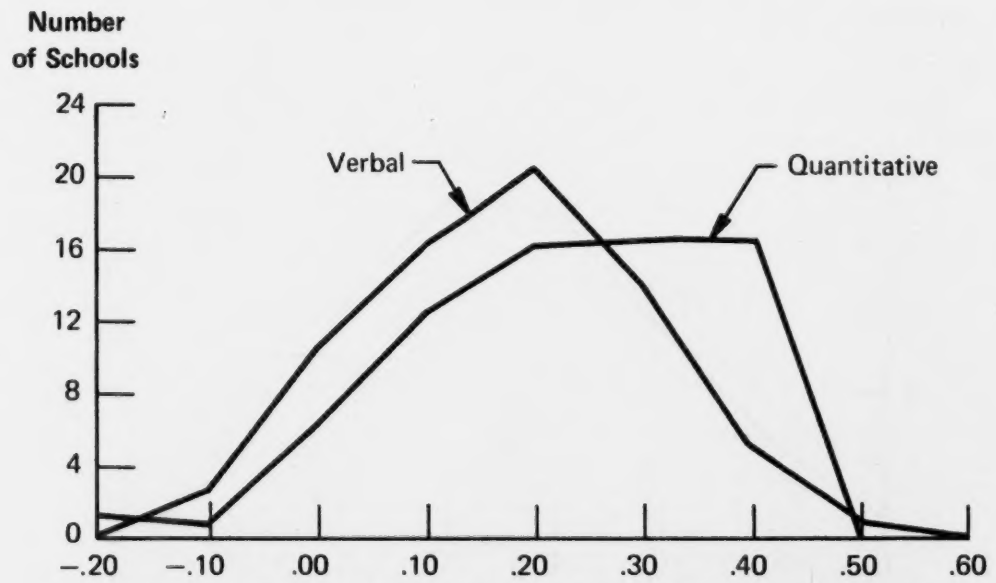


FIGURE 4. Distributions of validity coefficients for undergraduate record alone, ATGSB Total alone, and undergraduate record and ATGSB Total combined. (Based on 69 studies conducted in 1967-68—1969-70 for 67 graduate schools of business.)





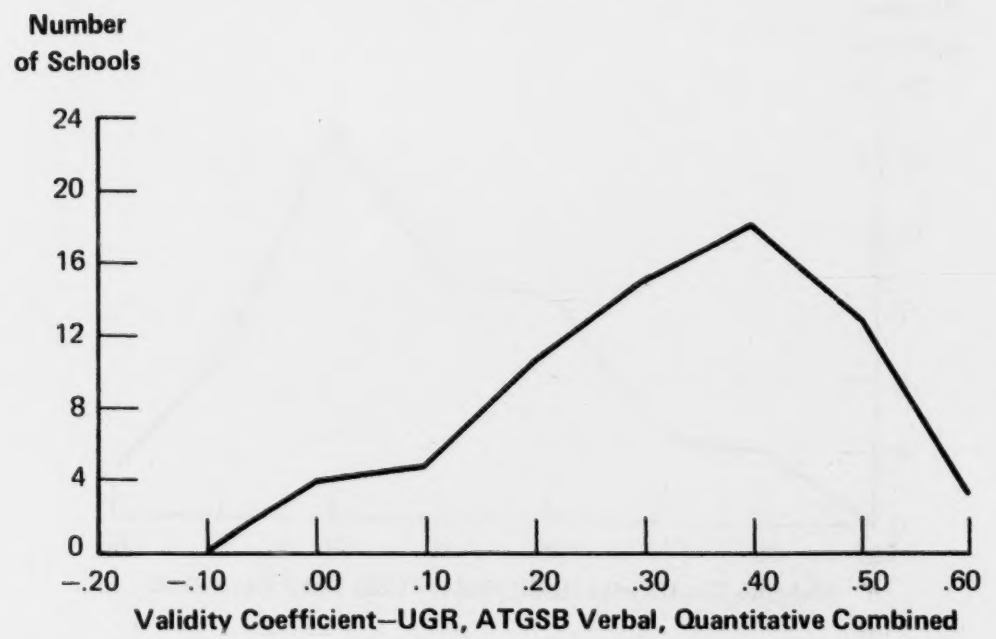
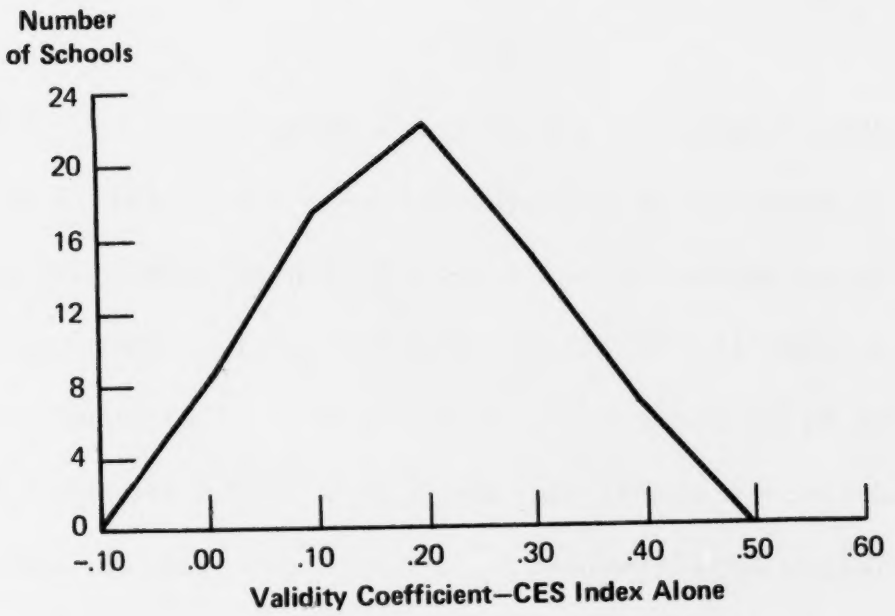
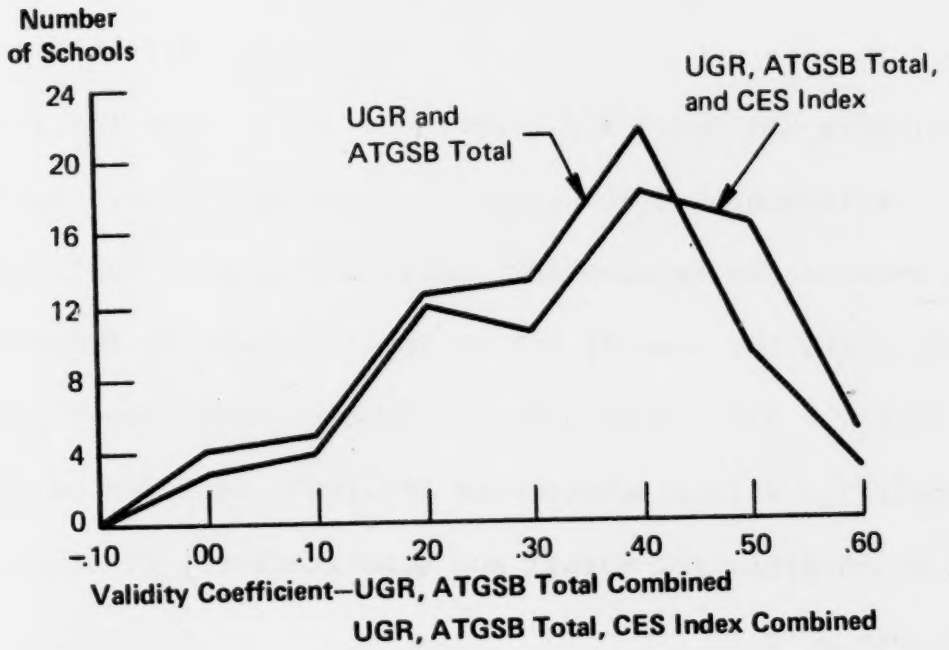


FIGURE 5. Distributions of validity coefficients for undergraduate record alone, ATGSB Verbal scores alone, ATGSB Quantitative scores alone, and UGR and ATGSB V and Q scores combined. (Based on 69 studies conducted in 1967-68–1969-70 for 67 graduate schools of business.)





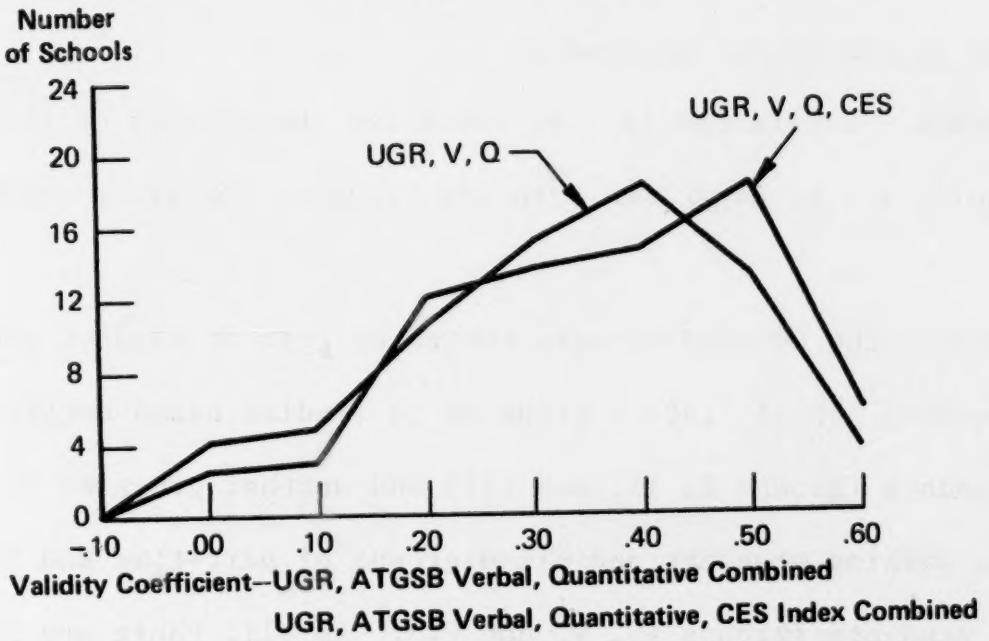


FIGURE 6. Distributions of validity coefficients for CES Index alone, UGR and ATGSB Total combined, UGR, ATGSB Total, and CES Index combined, UGR, ATGSB Verbal and Quantitative combined, and UGR, ATGSB Verbal and Quantitative, and CES Index combined. (Based on 69 studies conducted in 1967-68—1969-70 for 67 graduate schools of business.)

whether it was one where there was little or no difference.

Figure 6 is designed to call attention to the results for CES Index. Used alone, CES Index is generally not a very good predictor. Its median validity coefficient, over the 69 groups studies, is .17. When used in combination with UGR and ATGSB scores, which is the more likely way it would be used in an actual admissions situation, there is a slight tendency toward improvement in predictive effectiveness. In both instances (in combination with UGR and Total or V and Q) a slight shift toward higher coefficients when CES Index is used is apparent in Figure 6. The median coefficients for the combinations including CES Index are higher (by .02 in each instance) than the medians for the corresponding combinations without CES Index. Again, it would be advisable to examine the results for individual schools that have had validity studies, since the results of the inclusion of CES Index vary widely from school to school. While some schools' results show rather dramatic increases in predictive effectiveness when CES Index is added to the traditional team of UGR and ATGSB Total (or Verbal and Quantitative), at other schools there is no increase at all.

Summary Based on Six Groups of Studies

Figure 7 and Tables 1A - 4C summarize the results of the same 69 studies shown in Figures 1 - 6, organized into six groups. The groups were formed as follows:

First, the 69 studies were sorted by type of student (full-time day, part-time evening, etc.) into a group of 32 studies based entirely on full-time day students (groups I, II, and III) and another group of 37 studies based on part-time evening students and mixed groups of part-time and full-time, day and evening students (groups IV, V, and VI). In all, there are 5 studies based on part-time evening students and 32 on mixtures of part-time and full-time, day

and evening. Because there were so few part-time evening student groups, they were combined with the mixed groups for the purposes of this classification. Thus, groups I, II, and III consist of full-time day students only, and groups IV, V, and VI include all studies where any or all of the students were part-time or evening students.

Next, the 69 studies were sorted on ATGSB Total mean earned by the students on whose records the studies were based. The highest mean is 629, the lowest is 445, and the median is 518. The 34 studies in groups I, II, and IV are based on students whose ATGSB Total means are above 518; the 35 studies in groups III, V, and VI are based on students whose ATGSB Total means are 518 or below.

A third sorting was attempted on the number of students whose records were used for each of the studies. These numbers vary widely, from 81 for the smallest to 885 for the largest. The median size is 109 students. The full-time day student groups whose ATGSB Total means were above 518 were split into two groups, group I including 15 studies based on more than 109 students each, and group II including 6 studies based on fewer than 109 students each. Similarly the evening and mixed student groups whose ATGSB Total means were below 518 were split into two groups, group V including 8 studies based on more than 109 students each and group VI including 16 studies based on fewer than 109 students each. The full-time day student groups whose ATGSB means were 518 or below (group III - 11 studies) were not sorted by number of students, nor were the mixed student groups whose ATGSB means were above 518 (group IV - 13 studies). Note that in most instances the number of students per study is the number who had complete data including first-year averages and represents at least two classes combined, from the entering classes of 1966 and 1967, 1967 and 1968, or 1968 and 1969.

A tabular summary of the classification system follows:

Group	Number of Studies	Type of Student	ATGSB Total Mean	Number of Students Per Study
I	15	Full-Time Day	Above 518	More than 109
II	6	Full-Time Day	Above 518	Fewer than 109
III	11	Full-Time Day	518 or Below	Not classified on number of students
IV	13	Full-Time + Part-Time, Day + Evening	Above 518	
V	8	Full-Time + Part-Time, Day + Evening	Below 518	More than 109
VI	16	Full-Time + Part-Time, Day + Evening	Below 518	Fewer than 109
	69			

This classification system, based on type of student, ATGSB Total mean for the students whose records were used in the study, and number of students whose records were used in the study, was chosen for summarizing the study results in this report after an exploratory attempt at classification based on cluster analysis, using 23 characteristics. The results of the cluster analysis, as well as more detail about the groups used here, are given in Appendix C of this report. The grouping used here, rather than the results of the cluster analysis, was chosen for two reasons. First, the two-way clustering shown in Appendix C resulted in too many small groups. Second, one of the purposes of this tabulation of validity study summary data was to enable a school readily to find a group of schools similar to itself. The cluster analysis resulted in groups of schools which, while closest to each other in terms of squared Euclidean distances computed on 23 characteristics, were not describable in terms that would result in the unique assignment of an additional school to the classification. The characteristics used to determine the six groups for

the final classification were chosen after a careful study of the results of the cluster analysis.

Caution must be used in interpreting the results shown in Figure 7, especially in view of the small number of studies included in each group. One can observe some general trends, however, keeping in mind the realization that any one school may be an exception to any general trend that seems to be apparent.

In general, it appears that the test scores and grade point averages used in these studies are more effective predictors for full-time day student groups (particularly groups I and III) than for evening and mixed student groups. It is also for these groups that the ATGSB Quantitative score appears to be a more effective predictor than is the Verbal score. The difference between Verbal and Quantitative does not appear for the evening and mixed student groups in IV, V, and VI. At the schools included in group I it appears that, in general, more effective prediction can be obtained by using the separate Verbal and Quantitative scores rather than the Total. There is a slight trend in this direction for group II also, but for the other four groups (III, IV, V, and VI) UGR and ATGSB Total appear to yield generally as effective prediction as does the three-predictor combination of UGR, ATGSB Verbal and Quantitative.

CES Index, on the average, tends to produce an increase in predictive effectiveness for all six of the groups. The increase is most noticeable for groups III and VI, both of which include studies where the ATGSB Total mean was in the lower half ot the distribution of ATGSB Total means for the 69 studies.

The names of the schools included in each of the groups follow:

Group I (15 schools)

Boston U - Day
Columbia
Cornell
Dartmouth
NYU
Northwestern
Purdue
Stanford
UCLA
U. of Chicago
U. of Michigan - Day
U. of Pennsylvania
U. of Pittsburgh
U. of Virginia
Washington (Mo.)

Group II (6 schools)

Carnegie - Mellon
Indiana
London
Penn State
U. of California - Berkeley
U. of North Carolina

Group III (11 schools)

Brigham Young
Emory
Mc Gill
Michigan State
Rutgers
Syracuse
U. of Alabama
U. of Kansas
U. of Missouri
U. of Southern California
U. of Toronto

Group IV (13 schools)

Boston U. - Eve.
Fulleron State (Calif.)
MIT
Ohio State
San Diego State
Tulane
U. of Colorado
U. of Houston
U. of Iowa
U. of Michigan - Eve.
U. of Rochester
U. of South Carolina
U. of Washington

Group V (8 schools)

Bowling Green
George Washington
Hofstra
Kent State
Oklahoma City
St. John's
U. of Detroit
U. of Tennessee

Group VI (16 schools)

American
Long Island
North Texas State
Ohio
Pace
Roosevelt
Texas Christian
U. of Arizona
U. of Bridgeport
U. of Denver
U. of Hawaii
U. of Miami
U. of Montana
U. of San Francisco
U. of Wyoming
Western Michigan

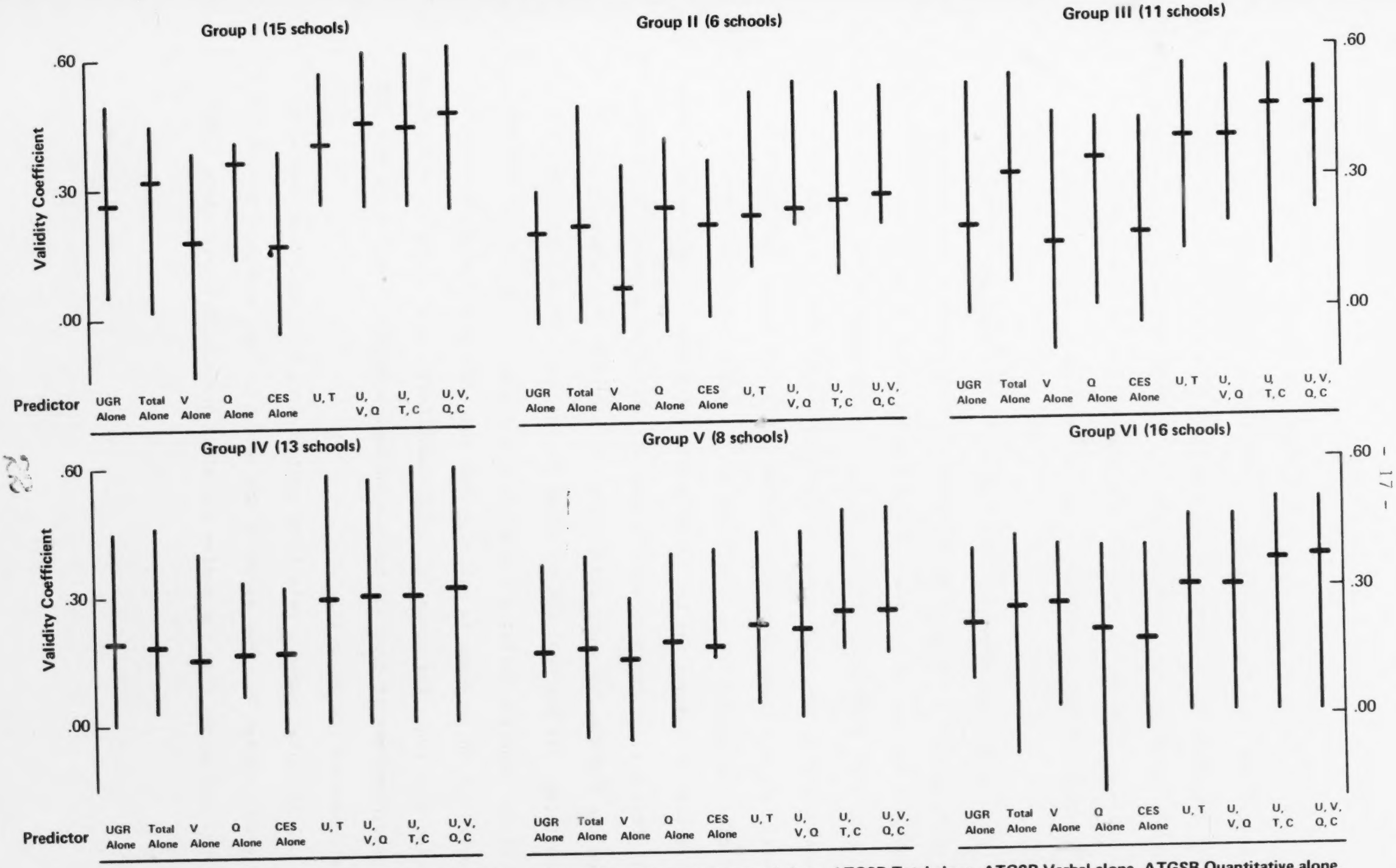


FIGURE 7. High, median, and low values of validity coefficients for undergraduate record alone, ATGSB Total alone, ATGSB Verbal alone, ATGSB Quantitative alone, CES Index alone, UGR and ATGSB Total combined, UGR and ATGSB Verbal and Quantitative combined, UGR, ATGSB Total, and CES Index combined, and UGR, ATGSB Verbal and Quantitative, and CES Index combined, at graduate schools of business arranged in six groups according to type of student (Groups I, II, and III have full-time day students only), ATGSB Total mean (Groups I, II, IV above 518), and number of students per study (Groups I and V more than 109, Groups II and VI fewer than 109). (Based on 69 studies conducted in 1967-68—1969-70 for 67 graduate schools of business.) See text for further definition of groups.

Tables 1A and 1B list all the validity coefficients for the 69 studies classified into the six groups described above. The studies are coded with a numeral and a letter of the alphabet. The numeral - 1, 2, or 3 - indicates the first, second, or third year of the ATGSB Validity Study Service, that is, 1967-68, 1968-69, or 1969-70. The alphabetic code then puts the studies in order according to number of student records on which the study was based.

The coefficients given in Tables 1A and 1B are the same as those plotted in Figures 1-7. It will be recalled that the median values based on all 69 coefficients are as follows: UGR alone, 23; ATGSB Total alone, .25: ATGSB Verbal alone, .18; ATGSB Quantitative alone, .23; CES Index alone, 17; UGR and ATGSB Total combined, .35; UGR, ATGSB Verbal and Quantitative combined, .35; UGR, ATGSB Total, and CES Index combined, .37; and UGR, ATGSB Verbal and Quantitative, and CES Index combined, .37. A comparison of the group medians with the over-all medians reveals a tendency for the ATGSB Quantitative score to be, on the average, a better predictor for groups I and III than for the other groups. For group I it is, on the average, the best single predictor (median .36 compared with .32 for ATGSB Total, .27 for UGR, .18 for ATGSB Verbal, and .17 for CES Index) and the use of the separate Verbal and Quantitative scores in combination with UGR tends to produce an increase in validity over that obtained from ATGSB Total in combination with UGR. For group III ATGSB Quantitative also tends to be the best single predictor, but it does not produce an improvement in combination with UGR like that observed for group I.

ATGSB Verbal makes a relatively poor showing as a predictor used alone for all groups except VI. For group VI its median is .26, equal to that for ATGSB Total and higher than the median for ATGSB Quantitative used alone (.20).

Table 1A

Correlations of Predictors with First-Year Business School Average Grades
for 67 Graduate Schools of Business Participating in 1967-68, 1968-69, and 1969-70
Validity Study Service
Groups I - III

Graduate School of Business	Correlation of First-Year Average Grades with: Undergraduate Record (U)	ATGSB Total (T)	ATGSB Verbal (V)	ATGSB Quant. (Q)	CES Index (C)	Combination of: U,T	U,V,Q	U,T,C	U,V,Q,C
				Group I					
1A	.30	.32	.18	.36	.17	.42	.45	.45	.48
1B	.29	.35	.20	.40	.27	.43	.47	.49	.52
1C	.06	.33	.22	.33	.32	.35	.36	.42	.43
1D	.27	.21	.15	.20	.07	.34	.34	.34	.34
1E	.30	.30	.12	.39	.16	.44	.51	.44	.51
1F	.25	.24	.03	.40	.29	.38	.51	.47	.57
1G	.25	.12	.05	.14	.00	.27	.26	.26	.25
1M	.50	.37	.18	.41	.07	.57	.62	.58	.62
2A	.35	.41	.27	.38	.26	.52	.53	.55	.55
2B-Day	.31	.02	-.13	.16	-.03	.29	.35	.28	.34
2C	.14	.45	.39	.37	.27	.47	.45	.48	.47
2E	.24	.27	.13	.28	.02	.37	.37	.36	.37
3A-Day	.24	.37	.20	.40	.15	.40	.44	.42	.45
3B	.40	.35	.20	.35	.39	.53	.56	.61	.63
3D	.17	.30	.21	.31	.23	.33	.34	.32	.34
Median	.27	.32	.18	.36	.17	.40	.45	.44	.47
				Group II					
1X	.27	.27	.24	.16	.22	.35	.34	.41	.41
2M	.14	.11	-.04	.22	.20	.11	.20	.21	.25
2P	-.02	.18	.05	.27	.15	.12	.22	.08	.20
2Q	.05	.22	.07	.27	.20	.19	.24	.26	.29
2V	.28	-.02	.01	-.04	-.01	.24	.22	.24	.21
3N	.22	.48	.34	.41	.35	.51	.53	.50	.52
Median	.18	.20	.06	.24	.20	.22	.23	.25	.27
				Group III					
1P	.52	.37	.22	.35	.14	.56	.55	.55	.54
1U	.08	.38	.27	.39	.43	.38	.39	.49	.49
1V	.28	.41	.27	.40	.27	.45	.46	.46	.47
1W	.46	.21	.10	.22	.08	.51	.51	.52	.52
2F	.40	.07	.11	.00	.08	.39	.39	.40	.41
2H	.15	.41	.40	.34	.40	.42	.42	.46	.46
2J	.34	.09	.04	.12	.17	.32	.32	.37	.36
2K	.19	.31	.15	.35	.26	.33	.38	.37	.42
2Y	-.01	.54	.45	.44	.23	.52	.52	.53	.52
3C	.12	.19	.13	.18	.15	.20	.19	.23	.22
3I	.18	.06	-.10	.20	-.04	.13	.28	.09	.26
Median	.19	.31	.15	.34	.17	.39	.39	.46	.46

The coefficients given in this table for combinations of predictors are shrunken multiple correlations.

Table 1B

Correlations of Predictors with First-Year Business School Average Grades for 67 Graduate Schools of Business Participating in 1967-68, 1968-69, and 1969-70 Validity Study Service
Groups IV - VI

Graduate School of Business	Correlation of First-Year Average Grades with: Undergraduate Record (U)	ATGSB Total (T)	ATGSB Verbal (V)	ATGSB Quant. (Q)	CES Index (C)	Combination of: U,T	U,V,Q	U,T,C	U,V,Q,C
				Group IV					
1J	.19	.26	.14	.26	.10	.29	.30	.30	.31
1Y	.34	.18	.10	.16	.09	.37	.34	.35	.33
2B-Eve	.45	.46	.40	.33	.32	.58	.57	.60	.59
2D	.21	.13	.15	.07	.16	.23	.23	.27	.27
2I	.07	.17	.15	.12	.17	.16	.12	.18	.15
2L	.39	.29	.23	.27	.26	.46	.46	.57	.57
2S	.14	.18	.16	.13	.15	.17	.13	.22	.20
3A-Eve	.15	.31	.27	.17	.16	.31	.32	.33	.33
3E	.11	.16	.11	.14	.09	.16	.14	.14	.12
3F	.30	.23	.13	.24	.14	.36	.36	.38	.38
3H	.40	.21	.23	.13	.19	.39	.40	.39	.40
3M	.00	.03	-.01	.07	-.01	*	*	*	*
3O	.08	.18	.03	.29	.16	.12	.26	.13	.23
Median	.19	.18	.15	.16	.16	.29	.30	.30	.31
				Group V					
1H	.15	.13	.11	.16	.17	.16	.18	.21	.22
1I	.26	.07	.08	.04	.13	.25	.24	.29	.28
1K	.29	.38	.28	.38	.39	.42	.43	.48	.48
1L	.10	.21	.16	.20	.17	.20	.18	.21	.19
1N	.16	.00	.01	.00	.14	.09	.03	.18	.16
1O	.36	.30	.27	.23	.23	.43	.43	.46	.45
2G	.12	-.04	-.05	-.02	.13	.03	*	.16	.14
3G	.11	.32	.18	.32	.25	.37	.38	.40	.43
Median	.16	.17	.14	.18	.17	.22	.21	.25	.25
				Group VI					
1Q	.27	.41	.40	.30	.27	.46	.46	.48	.48
1R	.36	.24	.28	.14	.20	.40	.41	.42	.43
1S	.16	.32	.24	.28	.27	.30	.28	.36	.34
1T	.38	.25	.35	.05	.16	.40	.45	.40	.45
1Z	.29	.22	.19	.18	.02	.29	.28	.27	.25
2N	.08	.09	.06	.09	.07	*	*	*	*
2O	.21	.07	.02	.11	.11	.18	.19	.22	.24
2R	.30	.31	.30	.23	.15	.37	.36	.37	.37
2T	.09	.27	.26	.21	.33	.26	.25	.36	.37
2U	.15	.18	.20	.10	.26	.16	.14	.24	.23
2W	.25	.10	.24	-.05	.12	.23	.31	.23	.31
2X	.31	.33	.27	.32	.34	.46	.46	.50	.50
2Z	.10	-.09	.03	-.18	-.04	*	.12	*	.05
3J	.14	.30	.25	.28	.39	.31	.30	.48	.47
3K	.23	.42	.34	.38	.36	.44	.42	.47	.46
3L	.20	.41	.33	.40	.16	.40	.40	.39	.39
Median	.22	.26	.26	.20	.18	.30	.30	.36	.37

The coefficients given in this table for combinations of predictors are shrunken multiple correlations.

*Shrunken value is indeterminate because the shrinkage formula does not yield a definite numerical value under these conditions.

CES Index, on the average, tends to produce an increase in predictive effectiveness, judged from a comparison of the median coefficients based on combinations including CES Index with the median coefficients based on the corresponding combinations which do not include CES Index, for all six of the groups. The increase is most noticeable for groups III and VI, both of which include studies where the ATGSB Total mean was in the lower half of the distribution of ATGSB Total means for the 69 studies.

Tables 2A - 2F provide the standard regression weights for each predictor in each of the four combinations and the multiple correlation coefficients as well as the shrunken multiples which were used in Figures 1, 2, and 3 and Tables 1A and 1B. Table 2A reports results for studies classified in group I; Table 2B, group II; Table 2C, group III, Table 2D, group IV, Table 2E, group V, and Table 2F, group VI. These tables are useful for considering the results in greater detail. For example, the observation from Table 1A, noted above, that the combination of the separate Verbal and Quantitative scores with UGR tends to yield more effective prediction for group I than does the combination of Total scores with UGR may be examined in greater detail in Table 2A. In looking at the regression coefficients one can readily observe a general trend for the Quantitative score to receive more weight in the regression equation for predicting first-year average grades than does the Verbal score. In every instance but one, where the weights are equal, the Quantitative score has a larger regression coefficient than does the Verbal score. The other tables show less consistency. Table 2F, for instance, based on 16 schools in group VI, has eight schools where the Quantitative score has a greater weight than the Verbal score and also eight schools where the Verbal score has a greater weight than the Quantitative score.

Table 2A

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Fifteen Graduate Schools of Business
Group I

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	ATGSB Scores: Verbal	ATGSB Scores: Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1A	.28	.30				.42	.42
1A	.27		.08	.32		.46	.45
1A	.34	.24			.19	.46	.45
1A	.33		.04	.28	.18	.48	.48
1B	.26	.33				.44	.43
1B	.25		.06	.36		.48	.47
1B	.25	.25			.24	.49	.49
1B	.30		.02	.30	.23	.52	.52
1C	.15	.36				.36	.35
1C	.14		.13	.31		.37	.36
1C	.25	.22			.31	.43	.42
1C	.25		.03	.23	.31	.44	.43
1D	.28	.22				.35	.34
1D	.28		.08	.18		.35	.34
1D	.29	.21			.07	.36	.34
1D	.29		.08	.17	.06	.36	.34
1E	.33	.33				.45	.44
1E	.34		-.04	.44		.52	.51
1E	.34	.31			.05	.45	.44
1E	.34		-.04	.43	.02	.52	.51
1F	.31	.30				.39	.38
1F	.32		-.07	.47		.52	.51
1F	.39	.12			.36	.48	.47
1F	.40		-.17	.36	.32	.58	.57
1G	.26	.14				.29	.27
1G	.26		.04	.13		.29	.26
1G	.26	.13			.01	.29	.26
1G	.26		.04	.13	.00	.29	.25
1M	.45	.30				.58	.57
1M	.48		-.01	.38		.63	.62
1M	.48	.28			.11	.59	.58
1M	.49		-.01	.37	.05	.63	.62
2A	.33	.39				.52	.52
2A	.33		.16	.33		.53	.53
2A	.37	.31			.20	.55	.55
2A	.37		.13	.26	.19	.56	.55
2B-Day	.31	.05				.31	.29
2B-Day	.31		-.13	.20		.38	.35
2B-Day	.31	.04			.02	.31	.28
2B-Day	.31		-.13	.20	.00	.38	.34
2C	.14	.45				.47	.47
2C	.15		.26	.26		.47	.45
2C	.18	.39			.15	.49	.48
2C	.19		.22	.22	.16	.49	.47
2E	.27	.29				.38	.37
2E	.27		.12	.27		.39	.37
2E	.28	.28			.04	.38	.36
2E	.28		.12	.26	.04	.39	.37
3A-Day	.19	.35				.42	.40
3A-Day	.18		.10	.36		.45	.44
3A-Day	.23	.31			.14	.44	.42
3A-Day	.22		.07	.34	.14	.47	.45
3B	.41	.36				.54	.53
3B	.43		.12	.36		.57	.56
3B	.44	.21			.34	.62	.61
3B	.46		.03	.27	.33	.64	.63
3D	.16	.30				.34	.33
3D	.15		.12	.26		.36	.34
3D	.16	.25			.08	.35	.32
3D	.16		.08	.23	.08	.37	.34

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group

Table 2B

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Six Graduate Schools of Business
Group II

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	ATGSB Scores: Verbal	ATGSB Scores: Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1X	.27	.26				.38	.35
1X	.27		.23	.12		.39	.34
1X	.29	.25			.23	.44	.41
1X	.29		.24	.08	.24	.45	.41
2M	.13	.10				.17	.11
2M	.15		-.04	.21		.26	.20
2M	.16	.05			.21	.27	.21
2M	.17		-.06	.16	.18	.31	.25
2P	.01	.18				.18	.12
2P	.00		-.08	.30		.28	.22
2P	.01	.15			.06	.19	.08
2P	.00		-.09	.29	.02	.28	.20
2Q	.10	.24				.24	.19
2Q	.11		.01	.29		.29	.24
2Q	.18	.20			.23	.31	.26
2Q	.19		.00	.26	.22	.35	.29
2V	.28	.02				.28	.24
2V	.28		.04	-.01		.28	.22
2V	.31	.01			.09	.29	.24
2V	.31		.03	-.02	.09	.30	.21
3N	-.22	.49				.53	.51
3N	-.23		.29	.37		.55	.53
3N	-.22	.48			.01	.53	.50
3N	-.23		.28	.36	.02	.55	.52

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group to group.

Table 2C

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Eleven Graduate Schools of Business Group III

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	ATGSB Scores: Verbal	ATGSB Scores: Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1P	.45	.24				.57	.56
1P	.45		.05	.22		.57	.55
1P	.45	.24			.01	.57	.55
1P	.45		.05	.21	.02	.57	.54
1U	.13	.40				.40	.38
1U	.11		.15	.33		.42	.39
1U	.23	.18			.40	.51	.49
1U	.20		.02	.21	.39	.52	.49
1V	.22	.38				.47	.45
1V	.23		.11	.35		.48	.46
1V	.24	.31			.16	.49	.46
1V	.25		.06	.31	.16	.51	.47
1W	.48	.25				.52	.51
1W	.49		.05	.25		.53	.51
1W	.51	.24			.16	.54	.52
1W	.51		.05	.23	.14	.55	.52
2F	.40	.03				.40	.39
2F	.40		.09	-.07		.41	.39
2F	.42	-.01			.12	.42	.40
2F	.42		.08	-.12	.15	.43	.41
2H	.14	.41				.43	.42
2H	.15		.33	.12		.44	.42
2H	.17	.23			.27	.48	.46
2H	.17		.19	.07	.26	.48	.46
2J	.33	.07				.34	.32
2J	.33		-.01	.11		.35	.32
2J	.36	-.03			.22	.39	.37
2J	.36		-.07	.05	.21	.40	.36
2K	.17	-.30				.35	.33
2K	.20		.02	-.37		.40	.38
2K	.20	-.21			-.21	.40	.37
2K	.24		.08	-.32	-.22	.45	.42
2Y	-.03	.54				.54	.52
2Y	-.04		.34	.32		.54	.52
2Y	-.01	.51			.14	.56	.53
2Y	-.01		.33	.30	.14	.56	.52
3C	.12	.19				.22	.20
3C	.12		.06	.17		.23	.19
3C	.14	.15			.14	.26	.23
3C	.15		.05	.14	.13	.26	.22
3I	.18	.05				.19	.13
3I	.22		-.16	.24		.32	.28
3I	.18	.05			-.01	.19	.09
3I	.22		-.15	.24	-.01	.32	.26

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group to group.

Table 2D

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Thirteen Graduate Schools of Business Group IV

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	Verbal	Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1J	.17	.25				.31	.29
1J	.19		.04	.26		.33	.30
1J	.20	.23			.11	.33	.30
1J	.21		.04	.24	.10	.34	.31
1Y	.35	.20				.39	.37
1Y	.35		.09	.15		.39	.34
1Y	.35	.18			.05	.39	.35
1Y	.35		.08	.13	.05	.39	.33
2B-Eve	.37	.38				.59	.58
2B-Eve	.38		.22	.25		.59	.57
2B-Eve	.37	.32			.19	.61	.60
2B-Eve	.37		.20	.20	.19	.61	.59
2D	.22	.15				.25	.23
2D	.21		.13	.04		.26	.23
2D	.25	.08			.17	30	.27
2D	.24		.10	.00	.17	.30	.27
2I	.10	.19				.20	.16
2I	.10		.12	.09		.19	.12
2I	.11	.14			.14	.23	.18
2I	.11		.09	.06	.14	.23	.15
2L	.38	.26				.47	.46
2L	.38		.13	.22		.49	.46
2L	.48	.19			.36	.58	.57
2L	.48		.14	.12	.36	.59	.57
2S	.13	.17				.22	.17
2S	.13		.12	.08		.22	.13
2S	.18	.13			.18	.28	.22
2S	.18		.12	.03	.19	.28	.20
3A-Eve	.15	.31				.34	.31
3A-Eve	.14		.28	.18		.36	.32
3A-Eve	.17	.28			.14	.37	.33
3A-Eve	.17		.27	.14	.15	.38	.33
3E	.12	.16				.19	.16
3E	.12		.06	.13		.20	.14
3E	.12	.14			.04	.20	.14
3E	.13		.05	.12	.05	.20	.12
3F	.30	.24				.38	.36
3F	.30		.08	.21		.39	.36
3F	.33	.20			.16	.41	.38
3F	.33		.07	.18	.15	.41	.38
3H	.38	.06				.41	.39
3H	.41		.18	-.14		.43	.40
3H	.37	.03			.10	.42	.39
3H	.40		.16	-.15	.10	.44	.40
3M	-.01	.03				.03	*
3M	.01		-.03	.08		.08	*
3M	-.01	.03			-.01	.03	*
3M	.01		-.04	.10	-.05	.09	*
3O	.09	.18				.20	.12
3O	.11		-.07	.32		.32	.26
3O	.11	.13			.12	.23	.13
3O	.12		-.09	.29	.08	.32	.23

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group to group.

* Shrunken value is indeterminate because the shrinkage formula does not yield a definite numerical value under these condtions.

Table 2E

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Eight Graduate Schools of Business
Group V

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	ATGSB Scores: Verbal	ATGSB Scores: Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1H	.14	.12				.19	.16
1H	.13		.04	.14		.22	.18
1H	.16	.08			.17	.25	.21
1H	.16		.04	.10	.16	.26	.22
1I	.26	.08				.27	.25
1I	.26		.07	.02		.27	.24
1I	.30	-.01			.19	.32	.29
1I	.29		.02	-.03	.19	.32	.28
1K	.22	.33				.43	.42
1K	.22		.07	.31		.45	.43
1K	.22	.21			.28	.50	.48
1K	.23		.02	.22	.27	.51	.48
1L	.10	.21				.23	.20
1L	.10		.09	.14		.23	.18
1L	.12	.15			.12	.26	.21
1L	.12		.06	.11	.13	.25	.19
1N	.16	.00				.16	.09
1N	.17		-.03	.03		.16	.03
1N	.19	-.08			.20	.24	.18
1N	.20		-.06	-.03	.20	.24	.16
1O	.34	.27				.45	.43
1O	.34		.18	.15		.45	.43
1O	.36	.19			.19	.48	.46
1O	.36		.11	.12	.19	.48	.45
2G	.11	-.03				.12	.03
2G	.12		-.06	.02		.13	*
2G	.13	-.13			.20	.21	.16
2G	.13		-.11	-.03	.20	.22	.14
3G	.24	.40				.39	.37
3G	.27		.09	.39		.41	.38
3G	.26	.35			.20	.43	.40
3G	.30		.04	.37	.22	.46	.43

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group to group.

* Shrunken value is indeterminate because the shrinkage formula does not yield a definite numerical value under these conditions.

Table 2F

Regression Coefficients, Multiple Correlation Coefficients, and Shrunken Multiples of Combinations of Predictors with First-Year Average Grades for Students in Sixteen Graduate Schools of Business Group VI

Graduate School of Business	Regression Coefficients: UGR	ATGSB Scores: Total	ATGSB Scores: Verbal	ATGSB Scores: Quant.	CES Index	Multiple Correlation	Shrunken Multiple
1Q	.24	.39				.47	.46
1Q	.24		.30	.16		.48	.46
1Q	.28	.31			.19	.50	.48
1Q	.27		.26	.10	.20	.51	.48
1R	.35	.22				.42	.40
1R	.34		.23	.03		.44	.41
1R	.37	.13			.18	.45	.42
1R	.36		.20	-.05	.20	.47	.43
1S	.09	.29				.33	.30
1S	.09		.14	.21		.33	.28
1S	.11	.25			.22	.39	.36
1S	.11		.14	.15	.21	.39	.34
1T	.35	.18				.42	.40
1T	.32		.31	-.09		.47	.45
1T	.36	.14			.12	.43	.40
1T	.33		.29	-.12	.12	.49	.45
1Z	.25	.16				.33	.29
1Z	.25		.11	.09		.33	.28
1Z	.24	.17			-.01	.33	.27
1Z	.25		.11	.10	-.01	.33	.25
2N	.07	.09				.12	*
2N	.07		.03	.07		.12	*
2N	.08	.07			.06	.13	*
2N	.08		.03	.06	.06	.13	*
2O	.22	.10				.23	.18
2O	.23		-.02	.16		.26	.19
2O	.26	.06			.17	.28	.22
2O	.28		-.05	.14	.18	.30	.24
2R	.25	.26				.39	.37
2R	.24		.19	.11		.40	.36
2R	.28	.20			.12	.41	.37
2R	.27		.17	.07	.12	.41	.37
2T	.11	.28				.29	.26
2T	.11		.22	.11		.30	.25
2T	.15	.17			.29	.40	.36
2T	.16		.22	-.03	.32	.41	.37
2U	.12	-.16				.21	.16
2U	.11		-.16	-.04		.23	.14
2U	.12	-.09			-.22	.30	.24
2U	.11		-.12	.01	-.22	.31	.23
2W	.25	.12				.27	.23
2W	.22		.28	-.13		.36	.31
2W	.27	.04			.13	.29	.23
2W	.23		.24	-.16	.11	.37	.31
2X	.35	.37				.48	.46
2X	.35		.21	.25		.49	.46
2X	.38	.20			.28	.53	.50
2X	.38		.09	.16	.27	.53	.50
2Z	.11	-.09				.14	*
2Z	.09		.09	-.21		.23	.12
2Z	.11	-.09			.01	.14	*
2Z	.09		.09	-.21	-.01	.23	.05
3J	.17	.31				.34	.31
3J	.16		.13	.21		.34	.30
3J	.30	.12			.44	.50	.48
3J	.30		.00	.12	.44	.50	.47
3K	.18	.40				.46	.44
3K	.18		.20	.25		.45	.42
3K	.22	.26			.23	.49	.47
3K	.22		.13	.16	.23	.49	.46
3L	.10	.38				.42	.40
3L	.12		.10	.32		.43	.40
3L	.10	.37			.05	.42	.39
3L	.12		.10	.31	.05	.43	.39

The regression coefficients given in this table are for use with standard scores and are thus comparable from predictor to predictor and from group to group.

* Shrunken value is indeterminate because the shrinkage formula does not yield a definite numerical value under these conditions.

Prediction for Major Field Subgroups

Although background information on students' undergraduate major fields was collected routinely in the ATGSB Validity Study Service no formal use was made of this information in the individual school reports. In most instances the major field subgroups within a graduate school of business are very small. When they are summarized over many schools, however, their results are useful for noticing trends. Tables 3A-3B list differences between actual mean first-year average grades and grades predicted from UGR, ATGSB Verbal and ATGSB Quantitative in standard error of estimate units for major field subgroups of 10 or more students, for each of the 69 studies classified in the six groups used in the preceding section of this report. Table 3A presents results for groups I, II, and III, and Table 3B for groups IV, V, and VI. Tables 4A and 4B correspond to Tables 3A and 3B, respectively, except that CES Index is included.

Past studies utilizing these same categories of major fields (humanities, science, social science, economics, business and commerce, engineering, and other) have shown a fairly consistent but small tendency for business and commerce majors and economics majors to perform better academically in graduate schools of business than predicted on the basis of their ATGSB scores and undergraduate records. Majors in other fields, except perhaps engineering, have, on the average, tended to achieve lower grades in graduate business school than predicted for them. In the current study the results for group I follow this general pattern. Group II has too few studies (6) for a clear trend to be evident, and group IV tends to fit the general pattern. Groups III, V, and VI (those with ATGSB Total means of 518 or lower) appear to follow a different pattern, however. For these groups there seems to be a tendency for the business and commerce majors to earn averages lower than predicted and the majors in other fields to do better than predicted.

Table 3A

Differences Between Actual Mean First-Year Average Grades and Grades Predicted from UGR, ATGSB Verbal and ATGSB Quantitative in Standard Error of Estimate Units for Major Field Subgroups of 10 or More Students

Groups I - II - III

Study Code	Undergraduate Major Field: Humanities 1	Science 2	Social Science 3	Economics 4	Business and Commerce 5	Engineering 6	Other 7	None Given 8	Humanities, Science, Social Science, Engineering and Other Combined 9
Group I									
1A	-.19	-.03	-.23	+.02	+.08	+.16	-.04	....	-.05
1B	....	-.21	-.30	+.17	+.35	+.09	-.04	....	-.10
1C	-.10	+.10	-.13	-.01	+.06	+.16	....	....	-.03
1D	-.46	+.14	-.25	+.09	+.10	-.14	....	....	-.25
1E	-.34	-.21	....	-.10	+.45	+.17	-.03	....	-.02
1F	-.15	-.05	-.14	+.04	-.38	+.26	-.12	....	+.04
1G	....	-.09	....	....	....	+.05	....	....	+.01
1M	....	-.07	-.66	+.22	.00	+.25	-.21	....	-.13
2A	-.36	-.13	-.13	+.08	+.15	+.04	....	....	-.12
2B-Day	...	....	-.41	+.03	-.10	+.69	....	+.23	.00
2C	+.09	-.41	-.12	+.15	-.23	+.19	....	....	-.01
2E	-.34	+.12	-.21	+.01	+.19	+.21	....	....	-.05
3A-Day	....	+.26	-.03	-.18	+.12	-.08	....	....	-.02
3B	....	-.06	-.27	-.18	+.01	+.19	....	....	+.04
3D	....	....	-.03	+.08	-.09	+.29	....	....	+.06
Group II									
1X	....	-.05	....	....	....	+.07	....	....	+.04
2M	....	....	....	+.31	-.09	....	+.26	....	+.13
2P	....	....	....	-.31	-.08	+.34	....	+.20	+.12
2Q	....	....	....	+.27	-.25	+.46	....	....	+.30
2V	....	-.04	....	+.28	+.22	-.22	....	....	-.15
3N	....	+.17	-.51	+.41	....	-.14	....	....	-.17
Group III									
1P	....	.00	-.38	-.01	-.45	+.36	+.38	....	+.06
1U	....	-.05	....	-.20	-.21	+.16	....	....	+.07
1V	....	....	+.19	-.03	-.31	....	....	....	+.24
1W	....	....	....	....	-.10	+.44	....	....	+.16
2F	....	....	+.12	....	-.06	-.18	....	+.35	+.01
2H	....	+.13	-.54	....	+.07	+.34	....	....	-.11
2J	....	....	....	....	-.19	....	+.42	....	+.50
2K	-.31	+.36	-.10	-.13	+.42	....	....	....	.00
2Y	....	....	-.07	-.06	....	....	....	+.21	-.10
3C	....	....	+.14	+.21	-.24	+.15	....	....	+.12
3I	....	....	-.32	-.11	+.25	....	-.53	....	-.04

Values based on 20 or more students are underlined; values based on 10 - 19 students are not underlined.

+ = actual greater than predicted.
- = actual less than predicted.

Table 3B

Differences Between Actual Mean First-Year Average Grades and Grades Predicted from UGR, ATGSB Verbal and ATGSB Quantitative in Standard Error of Estimate Units for Major Field Subgroups of 10 or More Students

Groups IV - V - VI

Study Code	Undergraduate Major Field: Humanities 1	Science 2	Social Science 3	Economics 4	Business and Commerce 5	Engineering 6	Other 7	None Given 8	Humanities, Science, Social Science, Engineering and Other Combined 9
Group IV									
1J	-.56	-.22	....	-.02	+.25	+.17	....	....	-.06
1Y	....	+.16	....	....	-.01	-.18	....	....	.00
2B-Eve	....	....	+.34	....	+.07	-.06	....	-.21	+.07
2D	....	+.14	-.13	-.05	+.05	+.09	....	....	-.04
2I	....	+.01	....	....	-.03	+.10	....	....	-.02
2L	....	....	....	....	....	....	-.03	+.26	-.03
2S	-.20	....	....	....	+.15	-.16	....	....	-.19
3A-Eve	....	....	....	+.03	+.02	+.04	....	....	-.03
3E	....	-.23	....	....	+.04	-.20	....	....	-.06
3F	....	-.07	....	+.24	+.37	-.09	....	....	-.16
3H	....	....	....	....	-.03	-.02	....	....	-.06
3M	....	....	....	....	+.01	-.13	....	....	-.01
3O	....	....	+.08	+.10	+.12	-.15	....	....	-.07
Group V									
1H	....	....	-.44	....	-.04	....	....	+.07	-.09
1I	....	.00	....	....	+.05	-.05	+.04	....	-.07
1K	....	-.41	....	....	-.17	+.19	+.37	....	+.08
1L	....	....	....	+.08	-.02	....	....	....	....
1N	....	....	....	....	-.10	+.42	....	....	+.31
1O	....	....	....	-.23	-.15	....	-.02	....	+.32
2G	-.15	+.37	+.13	+.13	-.27	....	+.30	....	+.16
3G	....	....	....	....	-.11	+.24	....	....	+.11
Group VI									
1Q	....	....	....	....	+.02	+.19	....	....	+.02
1R	....	....	....	....	-.12	....	....	....	+.21
1S	....	....	....	....	-.10	....	....	....	+.37
1T	....	....	....	....	+.02	....	....	....	....
1Z	....	....	....	....	+.08	-.48	....	....	-.17
2N	....	....	....	....	-.12	+.58	....	....	+.33
2O	....	....	....	-.22	-.03	....	....	....	+.29
2R	....	+.39	+.53	....	-.09	....	....	....	+.20
2T	....	....	....	....	+.06	-.16	....	....	-.12
2U	....	....	....	....	-.04	+.12	....	....	+.02
2W	....	....	....	....	-.05	....	....	....	+.21
2X	....	....	....	....	-.06	....	....	....	+.19
2Z	....	+.25	....	....	-.04	-.13	....	....	+.05
3J	....	....	....	....	-.11	+.44	....	....	+.30
3K	....	....	....	....	-.02	....	....	+.07	-.05
3L	....	-.23	....	....	+.12	+.32	....	....	-.15

Values based on 20 or more students are underlined; values based on 10 - 19 students are not underlined.

\+ = actual greater than predicted.
\- = actual less than predicted.

Table 4A

Differences Between Actual Mean First-Year Average Grades and Grades Predicted from UGR, ATGSB Verbal and Quantitative, and CES Index in Standard Error of Estimate Units for Major Field Subgroups of 10 or More Students

Groups I - II - III

Study Code	Undergraduate Major Field: Humanities 1	Science 2	Social Science 3	Economics 4	Business and Commerce 5	Engineering 6	Other 7	None Given 8	Humanities, Science Social Science, Engineering, and Other Combined 9
Group I									
1A	-.23	-.01	-.27	+.04	+.11	+.13	-.06	....	-.07
1B	....	-.14	-.37	+.19	+.47	+.07	+.07	....	-.11
1C	-.16	+.22	-.24	+.05	+.10	+.10	....	....	-.08
1D	-.47	+.12	-.29	+.10	+.11	-.18	....	....	-.28
1E	-.34	-.21	....	-.10	+.45	+.17	-.03	....	-.02
1F	-.13	+.03	-.14	+.06	-.28	+.14	-.05	....	+.02
1G	....	-.09	....	....	....	+.05	....	....	+.01
1M	....	-.03	-.66	+.20	.00	+.23	-.23	....	-.13
2A	-.45	-.15	-.20	+.08	+.25	+.01	....	....	-.16
2B-Day	....	....	-.41	+.03	-.10	+.69	....	+.23	.00
2C	+.09	-.37	-.15	+.13	-.26	+.19	....	....	-.03
2E	-.35	+.14	-.22	.00	+.21	+.21	....	....	-.05
3A-Day	....	+.24	-.04	-.17	+.13	-.11	....	....	-.04
3B	....	-.05	-.25	-.13	-.01	+.16	....	....	+.03
3D	....	....	-.03	+.09	-.08	+.26	....	....	-.04
Group II									
1X	....	+.04	....	....	....	+.01	....	....	+.03
2M	....	....	....	+.37	-.09	....	+.24	....	+.09
2P	....	....	....	-.31	-.08	+.33	....	+.21	+.12
2Q	....	....	....	+.26	-.20	+.33	....	....	+.22
2V	....	-.02	....	+.23	+.24	-.22	....	....	-.14
3N	....	+.17	-.51	+.41	....	-.14	....	....	-.17
Group III									
1P	....	+.01	-.38	-.02	-.43	+.35	+.37	....	+.06
1U	....	-.04	....	-.02	-.12	+.06	....	....	+.03
1V	....	....	+.15	-.01	-.27	....	....	....	+.20
1W	....	....	....	....	-.10	+.44	....	....	+.13
2F	....	....	+.06	....	-.05	-.21	....	+.33	.00
2H	....	+.06	-.55	....	+.09	+.33	....	....	-.15
2J	....	....	....	....	-.18	....	+.36	....	+.47
2K	-.36	+.36	-.02	-.11	+.43	....	....	....	-.02
2Y	....	....	-.02	-.07	....	....	....	+.19	-.07
3C	....	....	+.12	+.16	-.20	+.14	....	....	+.11
3I	....	....	-.31	-.11	+.25	....	-.52	....	-.04

Values based on 20 or more students are underlined; values based on 10 - 19 students are not underlined.

+ = actual greater than predicted.
- = actual less than predicted.

Table 4B

Differences Between Actual Mean First-Year Average Grades and Grades Predicted from UGR, ATGSB Verbal and Quantitative, and CES Index in Standard Error of Estimate Units for Major Field Subgroups of 10 or More Students

Groups IV - V - VI

Study Code	Undergraduate Major Field: Humanities 1	Science 2	Social Science 3	Economics 4	Business and Commerce 5	Engineering 6	Other 7	None Given 8	Humanities, Science, Social Science, Engineering and Other Combined 9
Group IV									
1J	-.57	-.18	....	-.04	+.25	+.17	....	....	-.06
1Y	....	+.14	....	....	+.01	-.18	....	....	-.01
2B-Eve	....	....	+.29	....	+.15	-.14	....	-.17	+.03
2D	....	+.07	-.15	-.04	+.09	+.03	....	....	-.09
2I	....	-.01	....	....	-.01	+.08	....	....	-.03
2L	....	....	....	....	....	....	-.04	+.33	-.04
2S	-.18	....	....	....	+.14	-.15	....	....	-.18
3A-Eve	....	....	....	-.01	+.02	+.01	....	....	-.03
3E	....	-.24	....	....	+.05	-.22	....	....	-.08
3F	....	-.05	....	+.27	+.35	-.11	....	....	-.16
3H	....	....	....	....	-.03	-.03	....	....	-.07
3M	....	....	....	....	+.01	-.12	....	....	.00
3Q	....	....	+.03	+.13	+.13	-.14	....	....	-.08
Group V									
1H	....	....	-.40	....	-.02	....	....	+.05	-.05
1I	....	-.01	....	....	+.08	-.07	-.02	....	-.10
1K	....	-.20	....	....	-.12	+.06	+.32	....	+.05
1L	....	....	....	+.05	-.01	....	....	....	....
1N	....	....	....	....	-.11	+.39	....	....	+.32
1O	....	....	....	-.34	-.13	....	+.01	....	+.32
2G	-.21	+.34	+.08	.19	-.23	....	+.25	....	+.12
3G	....	....	....	....	-.09	+.20	....	....	+.09
Group VI									
1Q	....	....	....	....	+.09	+.14	....	....	-.04
1R	....	....	....	....	-.10	....	....	....	+.18
1S	....	....	....	....	-.07	....	....	....	+.27
1T	....	....	....	....	+.03	....	....	....	....
1Z	....	....	....	....	+.08	-.47	....	....	-.17
2N	....	....	....	....	-.11	+.54	....	....	+.32
2O	....	....	....	-.18	-.01	....	....	....	+.18
2R	....	+.41	+.48	....	-.07	....	....	....	+.17
2T	....	....	....	....	+.08	-.36	....	....	-.17
2U	....	....	....	....	-.02	+.02	....	....	-.02
2W	....	....	....	....	-.05	....	....	....	+.19
2X	....	....	....	....	-.02	....	....	....	+.11
2Z	....	+.25	....	....	-.04	-.13	....	....	+.05
3J	....	....	....	....	-.12	+.35	....	....	+.31
3K	....	....	....	....	-.01	....	....	+.07	-.05
3L	....	-.24	....	....	+.12	+.32	....	....	-.15

Values based on 20 or more students are underlined; values based on 10 - 19 students are not underlined.

+ = actual greater than predicted.
- = actual less than predicted.

Cross-Validation Summary

Fourteen of the graduate schools of business participating in the ATGSB Validity Study Service provided data sufficient for using a cross-validation model for their studies. The results of the cross-validation are presented in Table 5. In each case the equations developed on group A were applied to the data for group B and the equations developed on group B were applied to the data for group A. The coefficients listed under the heading "Group A" are based on the use of group B's equations on group A's data and, similarly, the coefficients listed under "Group B" are based on the use of group A's equations on group B's data.

The groups are listed in order according to the size of the coefficient for group A, using the four predictors UGR, ATGSB Verbal and Quantitative, and CES Index. A comparison of the values in the column reveals considerable variation from one school to another, from a validity of .60 for the four-predictor coefficient at school A to .13 at school N. Within a school, however, the results seem to be more stable, although it is apparent that some schools exhibit more fluctuation than others.

The median coefficients given at the foot of Table 5 summarize the data for the fourteen schools. They show that, in general, there is a slight increase in validity from using the separate Verbal and Quantitative scores with UGR over that obtained from using the Total score with UGR, that does hold up in cross-validation. Similarly, the use of CES Index produces a slight gain which also holds up in cross-validation. The increases in medians due to the use of V and Q are .01 for group A and, for group B, .04 when CES is not included and .05 when it is included. The increases due to the use of CES are .02 for group A and, for group B, .01 when Total is used and .02 when V and Q are used.

Table 5

Correlation Coefficients for Various Combinations of Predictors in Cross-Validation Samples

Graduate School of Business	Group A Class	Validity for: UGR, ATGSB Total	UGR, V,Q	UGR, TOTAL, CES	UGR, V,Q, CES	Group B Class	Validity for: UGR, ATGSB Total	UGR, V,Q	UGR, TOTAL, CES	UGR, V,Q, CES
A	1967 Entrants	.48	.51	.57	.60	1968 Entrants	.60	.62	.64	.68
B	1965 Entrants	.42	.52	.41	.51	1966 Entrants	.40	.47	.37	.46
C	Fall 1968, Winter 1969, "Odd"	.51	.48	.47	.51	Fall 1968, Winter 1969, "Even"	.29	.36	.31	.38
D	1966 Entrants	.52	.48	.55	.49	1967 Entrants	.52	.51	.55	.54
E	1965 Entrants	.35	.40	.48	.48	1966 Entrants	.40	.56	.46	.57
F	1965 Entrants	.45	.47	.46	.48	1966 Entrants	.38	.43	.42	.47
G	1966 Entrants	.43	.42	.45	.44	1967 Entrants	.52	.51	.54	.54
H	1965 Entrants	.39	.37	.39	.38	1966 Entrants	.30	.28	.29	.27
I	1965 Entrants	.31	.29	.40	.38	1966 Entrants	.52	.57	.48	.52
J	1966 Entrants	.36	.38	.36	.38	1967 Entrants	.40	.40	.40	.40
K	1966 Entrants	.36	.37	.35	.36	1967 Entrants	.45	.45	.46	.45
L	1966 Entrants	.27	.15	.18	.15	1967 Entrants	.21	.10	.26	.13
M	1965 - 66 Class	.18	.14	.18	.14	1966 - 67 Class	.34	.30	.34	.29
N	1968 Entrants, "Odd"	.19	.19	.12	.13	1968 Entrants, "Even"	.26	.27	.24	.25
Median Validity		.38	.39	.40	.41		.40	.44	.41	.46

Historical Summary

Over the years since the ATGSB was first administered in 1954, twenty graduate schools of business have had two or more validity studies carried out by ETS. Table 6 presents a summary of the results of the studies for these 20 schools. These tables are useful for considering trends over time. There is an apparent trend, as shown by the ATGSB Total means and standard deviations given at the right of the table, for the schools to make heavier use of ATGSB scores in their selection procedures in the more recent years, or perhaps, for students to self-select themselves, to a greater extent. That is, there is a general increase in ATGSB Total mean with an accompanying decline in standard deviation. This phenomenon could be expected to produce an apparent decline in the validity of ATGSB Total scores for predicting first-year average grades in graduate schools of business, since some of the validity would have been used up, so to speak, in the selection process. There is, indeed, a tendency toward a trend in this direction.

Table 6 can also be examined for possible trends in the relative effectiveness of the Verbal and Quantitative scores. In practically all instances the Quantitative score has been a more effective single predictor than has ATGSB Verbal and this is true of the earlier as well as the more recent studies. The notable exceptions, at schools 11, 19, and 20 may indicate that these schools have made more stringent use of the Quantitative score relative to the Verbal score in selecting their classes, or that students who chose to apply to these schools were more homogeneous in quantitative ability than they were in verbal ability as measured by ATGSB. These differences may also be due in part to sampling fluctuation, which would, of course, be greater for studies based on smaller groups of students, such as were used for the studies carried out for school 19.

Table 6

Historical Summary of
Correlations of ATGSB and Undergraduate Record with First-Year Grades
in Graduate Schools of Business

Graduate Business School	Year of Entrance	Number of Students	Correlations of First-Year Average Grades with: Undergraduate Record	ATGSB Total	ATGSB Verbal	ATGSB Quant.	UGR and ATGSB Total	UGR, V, and Q	ATGSB Total Mean	ATGSB Total S.D.
1	1954	101-200	.23	.44	...	...	.49(.48)	...	487	91
1	1958	101-200	.17	.45	.29	.42	.52(.51)	.52(.50)	528	80
1	1962	>200	.33	.37	.27	.31	.47(.47)	.47(.46)	523	74
1	1965,1966	>200	.30	.32	.18	.36	.42(.42)	.46(.45)	557	70
2	1954	>200	.31	.46	...	...	.49(.49)	...	564	81
2	1958	>200	.29	.40	.22	.36	.46(.46)	.46(.45)	585	70
2	1962	>200	.27	.37	.22	.29	.44(.43)	.40(.40)	588	63
3	1962	101-200	.40	.44	.27	.41	.56(.55)	.55(.54)	578	68
3	1965,1966	>200	.29	.35	.20	.40	.44(.43)	.48(.47)	608	66
4	1954	101-200	.38	.28	...	...	.43(.41)	...	527	76
4	1958	>200	.37	.45	.33	.40	.52(.52)	.52(.51)	514	83
4	1962	101-200	.35	.25	.19	.19	.41(.40)	.40(.38)	509	76
4	1966	>200	.06	.33	.22	.33	.36(.35)	.37(.36)	543	78
5	1954	<50	.24	.33	...	...	.40(.26)	...	533	101
5	1958	50-100	.25	.47	.21	.48	.50(.48)	.53(.50)	493	90
5	1962	50-100	.37	.55	.40	.50	.60(.58)	.59(.58)	535	81
5	1966,1967	>200	.35	.41	.27	.38	.52(.52)	.53(.53)	572	75
6	1962	50-100	.43	.27	.20	.22	.46(.43)	.45(.41)	525	69
6	1966,1967	>200	.14	.45	.39	.37	.47(.47)	.47(.45)	562	73
7	1962	50-100	.14	.59	.35	.58	.62(.60)	.62(.60)	529	72
7	1965,1966	>200	.30	.30	.12	.39	.45(.44)	.52(.51)	550	74
8	1954	50-100	.35	.50	...	...	.56(.54)	...	540	73
8	1958	50-100	.28	.40	.28	.38	.46(.44)	.47(.44)	526	79
8	1962	50-100	.29	.49	.30	.46	.59(.57)	.59(.56)	529	76
8	1965,1966	>200	.25	.24	.03	.40	.39(.38)	.52(.51)	555	74
9	1962	50-100	.21	.38	.26	.35	.45(.42)	.47(.42)	535	84
9	1967,1968	101-200	.40	.35	.20	.35	.54(.53)	.57(.56)	557	61
10	1958	<50	...	.35	.17	.35	...	...	501	65
10	1962	50-100	.43	.27	.16	.27	.49(.45)	.50(.45)	514	60
10	1966,1967	101-200	.24	.27	.13	.28	.38(.37)	.39(.37)	548	60

The numbers in parentheses are shrunken values of the multiple correlation coefficients immediately to their left.

In comparing the multiple correlation coefficients, it is important to use the coefficients corrected for shrinkage, since this correction helps to adjust for the bias inherent in the computation of multiple correlation coefficients based on relatively small groups of students and several predictors.

Table 6 (continued)

Historical Summary of
Correlations of ATGSB and Undergraduate Record with First-Year Grades
in Graduate Schools of Business

Graduate Business School	Year of Entrance	Number of Students	Correlations of First-Year Average Grades with: Undergraduate Record	ATGSB Total	ATGSB Verbal	ATGSB Quant.	UGR and ATGSB Total	UGR, V, and Q	ATGSB Total Mean	ATGSB Total S.D.
11	1962	50-100	.27	.24	.27	.10	.36(.32)	.38(.32)	498	79
11	1966,1967	101-200	.40	.07	.11	.00	.40(.39)	.41(.39)	518	72
12	1954	101-200	.51	.56	...	...	.64(.64)	...	500	86
12	1958	50-100	.27	.45	.25	.40	.50(.47)	.49(.46)	514	87
12	1962	101-200	.24	.32	.17	.35	.36(.34)	.41(.38)	527	76
12	1962-1968	101-200	.15	.31	.27	.17	.34(.31)	.36(.32)	547	56
12	1968,1969	101-200	.24	.37	.20	.40	.42(.40)	.45(.44)	572	69
13	1954	50-100	.24	.09	...	...	.25(.18)	...	515	98
13	1962	50-100	.22	.43	.30	.38	.49(.46)	.47(.43)	500	82
13	1965,1966	101-200	.50	.37	.18	.41	.58(.57)	.63(.62)	523	68
14	1958	<50	.01	.76	.18	.76	.76(.73)	.80(.75)	595	63
14	1962	50-100	.07	-.12	-.18	-.05	.13(...)	.18(...)	604	55
14	1967,1968	101-200	.30	.23	.13	.24	.38(.36)	.39(.36)	618	65
15	1954	101-200	.35	.32	...	...	.42(.40)	...	489	96
15	1967	101-200	.19	.31	.15	.35	.35(.33)	.40(.38)	508	71
16	1961,1962	<50	.19	.54	.32	.56	.55(.52)	.58(.54)	491	78
16	1966,1967, 1968	101-200	.18	.06	-.10	.20	.19(.13)	.32(.28)	498	58
17	1962	101-200	.44	.39	.43	.25	.51(.50)	.53(.51)	486	93
17	1966,1967	50-100	.05	.22	.07	.27	.24(.19)	.29(.24)	536	64
18	1961,1962	50-100	.35	.20	.17	.18	.40(.37)	.41(.37)	480	89
18	1965,1966	50-100	.28	.41	.27	.40	.47(.45)	.48(.46)	481	73
19	1954	<50	.48	.55	...	...	.59(.56)	...	604	91
19	1958	<50	.22	.37	.32	.18	.41(.35)	.39(.27)	567	70
19	1962	<50	.07	.25	.18	.29	.26(.17)	.30(.17)	618	60
19	1964,1965, 1966	50-100	.27	.27	.24	.16	.38(.35)	.39(.34)	629	52
20	1954	50-100	.58	.50	...	...	.69(.68)	...	414	84
20	1961,1962	<50	.46	.35	.55	-.04	.53(.48)	.63(.57)	462	65

The numbers in parentheses are shrunken values of the multiple correlation coefficients immediately to their left.

In comparing the multiple correlation coefficients, it is important to use the coefficients corrected for shrinkage, since this correction helps to adjust for the bias inherent in the computation of multiple correlation coefficients based on relatively small groups of students and several predictors.

The data in Table 6 can also be used to compare the relative effectiveness of the combination of UGR and ATGSB Total with UGR, V, and Q. If only the earlier studies were available one would probably conclude that the combination of UGR and ATGSB Total was as effective as the use of the separate Verbal and Quantitative scores. If one looks only at the most recent study for each of the 20 schools, however, there are 14 instances where the shrunken multiple based on the three-predictor (UGR, V, Q) combination is higher than the shrunken multiple based on the two-predictor combination (UGR and ATGSB Total). The median gain is about .03. At some schools, at least, it would appear that the use of the separate Verbal and Quantitative scores in combination with UGR would yield more effective prediction than would the use of UGR and ATGSB Total.

Appendix A

Copies of Letters of Invitation and
Data Collection Materials Used in
ATGSB Validity Study Service

Memorandum for: All Graduate Business Schools
and Programs Requiring the
Admission Test for Graduate Study
in Business

Subject: Validity Study Service From: Herman F. Smith

Since the beginning of the ATGSB program many studies of the validity of the scores as predictors of first year business school grades have been completed. Some of these have been done in connection with the factor analysis of the test and the tryout of test materials; others have been part of a continuing series of periodic checks on the validity of the scores at a variety of schools.

At its meeting earlier this month, the ATGSB Policy Committee approved an ETS proposal to provide an individual validity study for each requiring school wishing to participate. These studies are to be completed at Program expense over a three year period.

The outcome of the studies will be a separate report for each school. The core of these reports will consist of a multiple regression equation in which ATGSB scores, undergraduate grades, and any other quantified predictors used by the school can be entered to yield a predicted first year average grade on the school's own grading system. In addition, prediction and probability charts will be provided along with other information which has been found to be of value in the admissions process. The Policy Committee also authorized the organization of prediction workshops so located that schools whose studies are completed can meet with ETS staff members and experienced admissions officers from Committee schools for discussion of the results.

Studies will begin this fall for the first group of schools with the workshops to be scheduled in the spring of 1968. This pattern will then be repeated twice more until all schools desiring such a study have had an opportunity to participate.

The only out-of-pocket expenses to a school will be those incurred in attending the workshop. However, some effort will be involved in recording the required data in a prescribed format and providing this to ETS. Ideally data should be provided on two successive classes of about 100 or more students each, thus permitting cross-validation. In the many instances where this will be impossible, two or even three classes may be combined to provide the approximately 100 cases needed for a creditable validity study.

Enclosed you will find a brief questionnaire designed to help us plan for this three year project. While we have asked for a preference concerning which year participation is desired, we will not be able to accommodate much more than a third of all requiring schools in any one year. In deciding on a preferred year for participation, consideration should be given to numbers of students on whom complete information is available and to consistency or comparability as far as curriculum and grading systems are involved. This is especially true if classes must be combined to achieve the desired numbers. Those schools participating this year will receive data recording forms and instructions for their completion around September 30. Workshop schedules will be worked out when study completion deadlines become firm.

We hope that your school will be able to participate and are looking forward to hearing from you soon.

Admission Test for Graduate Study in Business

Validity Study Service

1. School _____

2. Name and address of contact for this project:

_____

_____

_____

_____

3. Do you wish to participate in this service?

Yes ____ No ____

4. Will you be able to provide data (essentially; names, identification information, test scores, undergraduate grade point average, and first graduate year grade point average) for:

a. Two consecutive classes of about 100 or more students _____

b. Approximately 100 students from a single class _____

c. Approximately 100 students by combining two or three classes _____

(Note: Data on most recent classes completing first year graduate study, about 24 semester hours, is desirable. Where classes are to be combined grading systems must remain constant for all classes)

5. Preference for year of participation: (Show 1st and 2nd choices)

1967-68 _____

1968-69 _____

1969-70 _____

No preference _____

6. Place an "x" in the square which most nearly characterizes your program. Use back of sheet to clarify or to describe program if desired; e.g. such as multiple programs.

	Time required to complete program on full-time basis	
	2 yr.	1 yr.
Majority students full-time		
Majority students part-time		

7. Any school which would prefer to provide data by means of its automatic data processing system, please detail data available and preferred form of transmission.

ADMISSION TEST FOR GRADUATE STUDY IN BUSINESS VALIDITY STUDY SERVICE

Description of Data Required from Schools

The data described below should be provided for the two most recent classes for which first-year grades are available. If the total number of students in the two classes is not 100 or more, please supply data for a third class. Please start the list for each class on a new page of the data recording form, identifying the class in the space labeled Year of Entrance near the top of each page. The section numbers below refer to the column headings on the data recording forms.

At the top of the roster please enter your school's name and the appropriate four-digit code from the College Coding List which is enclosed for your convenience. Note that institutions whose names begin "University of ..." are alphabetized under "U", beginning on page 40.

(1) Name. This will be used purely for identification purposes. Data relating to individuals will be kept confidential. All members of the class should be listed, even if they did not complete the first year's work.

(2) First-year average grade in business school. For students who completed the full year, please provide their over-all average for the year. A numerical average would be preferable to a letter-grade average. This grade point average should be based on at least 24 hours of course work. If students took varying amounts of time to complete 24 hours of course work, please use column (13) to indicate the number of years each student took to complete one year's work (or its equivalent). Details concerning the use of column (13) are given below in the section numbered (13). It would also be useful for us to have a brief description of your grading system (e.g. A = 4, B = 3, C = 2, D = 1); a reference to the appropriate page of your catalog or bulletin would be very suitable for this purpose.

(3) Undergraduate Record. We would like to obtain each student's undergraduate record (grade point average) in the form in which this measure is used in making your own admissions decisions -- for example, over-all average grade in undergraduate study or average grade based on last two years of undergraduate study. If you adjust your measure of undergraduate performance to compensate for differences in the quality of undergraduate school, please give us the adjusted measure and indicate that it is an adjusted measure.

It is essential that undergraduate averages for all your students be presented in the same form. Two or more systems of recording undergraduate average (e.g. letter grades and percents) should not be mixed. If there are a few undergraduate averages which for some reason you have not converted to the scale on which most of them are recorded, please try to estimate what they would be on the common scale.

It would be useful to us if you would give a brief description of the measure of undergraduate record which you provide.

(4,5,6) ATGSB Scores. In the appropriate columns, please enter the ATGSB Verbal, Quantitative, and Total scores. If a student was tested more than once, list his most recent scores in columns (4), (5), and (6) and record his earlier scores in columns (17), (18), and (19). (For students tested three or more times, the two most recent sets of scores will be sufficient.) If you enter scores in columns (17), (18), and (19) for a student, please enter a 2 in column (16) for that same student, to indicate that he took the ATGSB more than once.

(7) CES Index. Please ignore this column. It is to be used by ETS in processing the over-all series of studies.

(8) Additional Predictor. You may list any primary quantified variable (not exceeding 3 digits) you use in conjunction with ATGSB scores and undergraduate grades for admissions purposes. If you use no other quantified variable or do not wish to provide data for one, leave this column blank. If you do list data in column (8) please provide a description of the variable -- its name, the possible range of its numerical scale, and an explanation of how it is used in the admissions process at your school.

(9) Undergraduate College Code. Please enter in this column the 4-digit code from the enclosed College Coding List. If you do not find the name of the college on the list write the name of the college and the state or country where it is located in the "Remarks" column (20). Note that some foreign universities (e.g. University of London, code 0972) are listed individually; others will have to be coded 0900 (see p. 46 Miscellaneous Foreign and Territorial Dependencies). Also note that institutions whose names begin with "College of" or "University of" are alphabetized under "C" or "U" respectively.

(10) Age. Please record the student's age to the nearest year as of July 1 of the calendar year when he entered your school. If this information is not readily available to you, leave the column blank.

(11) Major Field Code. Please enter in column (11) the major field code corresponding to the student's undergraduate major field. Note that the major field code is printed on the ATGSB score report for each student (01 Humanities, 02 Science, 03 Social Science except Economics, 04 Economics, 05 Business and Commerce, 06 Engineering, and 07 Other).

(12) Drop-outs and Failures. In the column labeled "Drop-out", please provide information on the academic status of each student who has left the class, using the following symbols:

1 = Dismissed for academic reasons, or withdrew voluntarily in unsatisfactory academic standing.

2 = All other withdrawals.

The drop-out group should include students who completed the first year but will not or did not return for the second year, as well as students who did not complete the first year.

Note that those students dismissed for academic failure after completing their final examinations are classified as withdrawals but have a first-year average to report as well.

(13,14,15) Special Codes. Columns (13), (14), and (15) are to be used to facilitate the identification of subgroups within a class. If all of the students on a page belong to the same subgroup it is not necessary to write the code for every student; writing it once, for the first student listed on the page, would be sufficient. The columns should be used to indicate the following information:

(13) Number of Years Taken to Complete First Year (at least 24 semester hours, or the equivalent).

0 = Grade point average recorded in column (2) is based on less than 24 hours (i.e. first year not completed)

1 = First year (at least 24 hours) completed in one year, less than one year, or more than one year but less than two years

2 = First year completed in two years but less than three years

3 = First year completed in three years but less than four years

4 = First year completed in four years but less than five years

5 = First year completed in five or more years

(14) Full-Time or Part-Time

1 = Full-Time Student

2 = Part-Time Student

(15) Day or Evening

1 Day

2 = Evening

Note: If you have no evening classes and this distinction is not applicable, you may leave the entire column blank.

(16,17,18,19) Previous Scores -- Repeaters Only. These columns are to be used only if you wish to enter more than one set of ATGSB scores for students who took the ATGSB more than once. (See columns (4), (5), and (6).) For each student who repeated the ATGSB, enter a 2 in column (16) to indicate that he is a repeater and record his previous scores in columns (17), (18), and (19). (His most recent scores should be recorded in columns (4), (5), and (6). For students tested three or more times, the two most recent sets of scores will be sufficient.) If you have many students who repeated the ATGSB, we would appreciate learning whether you use the most recent score, the earliest score, the highest score, an average or some other combination in your admissions procedures.

(20) Remarks. This column is to be used for names of uncoded undergraduate colleges. (See column (9) above.) In addition, please use this column to designate students who are atypical in ways that may make them incomparable with other students for purposes of this study. For example, students who did not complete a full undergraduate program before admission to business school and foreign students with language handicap should be noted here.

Please address the completed rosters to:

Mr. Herman F. Smith
Program Director
Admission Test for Graduate Study in Business
Educational Testing Service
Princeton, New Jersey 08540

If you have any questions about what to record, please telephone Mr. Herman F. Smith at the Educational Testing Service (Area Code 609, 921-9000, Extension 2909).

Page _____ of _____ pages

ATGSB Validity Study Service Data Recording Form

Business School Name _____

Business School Code _____ Year of Entrance _____

	Name	First-Year Average	Under-Grad. Record	ATGSB Verbal Score	ATGSB Quant. Score	ATGSB Total Score	CES Index	Addnl Pre-dictor	Undergrd. College Code	Age	Major Field Code	Drop-out	Spec. Codes*			Previous Scores-Repeaters				Remarks
													No. of Yrs	Full- or Part-Time	Day or Eve	Rep. Code*	ATGSB V	ATGSB Q	ATGSB Total	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
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20.																				

*See instructions.

EDUCATIONAL TESTING SERVICE PRINCETON, N.J. 08540

Area Code 609
921 - 9000
CABLE-EDUCTESTSVC

Admission Test for
Graduate Study in Business

ATGSB Validity Study Service
Background Information

Since the beginning of the Admission Test for Graduate Study in Business program, many studies of the validity of the scores as predictors of first-year business school grades have been completed. Some of these have been conducted in connection with the factor analysis of the test and the tryout of test materials; others have been part of a continuing series of periodic checks on the validity of the scores at a variety of schools.

At its meeting in May of 1967 the ATGSB Policy Committee approved a proposal of Educational Testing Service to provide an individual validity study for each requiring school wishing to participate. These studies, inaugurated in 1967, were to be offered over a three-year period and at the program's expense. By the end of the third year (1969-70) all schools requiring the test of virtually all applicants will have had an opportunity to participate in the service.

An individual report is prepared for each school participating in the validity study service, and each school receives only its own report. The heart of the report is the multiple regression equation derived for each school, into which an applicant's data (ATGSB scores, undergraduate grades, and any other quantified predictors used by the school) can be entered to yield a predicted first-year average grade on the school's own grading system. In addition to the section of the report that is unique to each school, prediction and probability tables and charts are provided for all schools as well as other information that has been found to be of value in the admission process. To aid in the interpretation and use of the results of the validity studies, the Policy Committee has authorized the organization of workshops in various locations where school representatives can meet to discuss results of their studies with members of the ETS staff and with experienced admissions officers from Policy Committee schools.

The validity study service is provided at no charge to participating schools except for expenses incurred in connection with attendance at a workshop, but there is a considerable investment of time and effort called for in the preparation of data in the format prescribed. Data for a minimum of 100 students are required, and they should be submitted for an entire class even though the class may have more than 100 students. Ideally, data should be provided for two classes of successive years, each containing 100 or more students, so that a cross-validation model can be used. Of course, such quantities of data are often not available, especially in schools with small or part-time enrollments. In these cases it is permissible to combine two or even three classes in order to provide the minimum of 100 cases needed for a creditable validity study.

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ATGSB Validity Study Service

DESCRIPTION OF DATA REQUIRED FROM SCHOOLS

The data described below should be provided for the two most recent classes for which first-year grades are available. If the total number of students in the two classes is not 100 or more, please supply data for a third class. Please start the list for each class on a new page of the data recording form, identifying the class in the space labeled Year of Entrance near the top of each page. The section numbers below refer to the column headings on the data recording forms.

At the top of the roster please enter your school's name and the appropriate four-digit code from the College Coding List, a copy of which is enclosed for your convenience. Note that institutions whose names begin "University of..." are alphabetized under "U," beginning on page 158.

(1) Name. This will be used purely for identification purposes. Data relating to individuals will be kept confidential. All members of the class should be listed even if they did not complete the first-year's work.

(2) First-year average grade in business school. For students who completed the full year, please provide their over-all average for the year. A numerical average would be preferable to a letter-grade average. This grade point average should be based on at least 24 hours of course work. If students took varying amounts of time to complete 24 hours of course work, please use column (13) to indicate the number of years each student took to complete one year's work (or its equivalent). Details concerning the use of column (13) are given below in the section numbered (13). Please provide a brief description of your grading system (e.g., A=4, B =3, C=2, D=1); a reference to the appropriate page of your catalog or bulletin would be suitable for this purpose.

(3) Undergraduate Record. We would like to obtain each student's undergraduate record (grade point average) in the form in which this measure is used in making your own admissions decisions. For example, over-all average grade in undergraduate study or average grade based on last two years of undergraduate study. If you adjust your measure of undergraduate performance to compensate for differences in the quality of undergraduate school, please give us the adjusted measure and indicate that it is an adjusted measure.

It is essential that undergraduate averages for all your students be presented in the same form. Two or more systems of recording undergraduate average (e.g., letter grades and per cents) should not be mixed. If there are a few undergraduate averages which for some reason you have not converted to the scale on which most of them are recorded, please try to estimate what they would be on the common scale.

Please provide us with a brief description of the measure of undergraduate record you are using, e.g., what is high, average, and low.

(4,5,6) ATGSB Scores. In the appropriate columns, please enter the ATGSB Verbal, Quantitative, and Total scores. If a student was tested more than once, list his most recent scores in columns (4), (5), and (6) and record his earlier scores in columns (17), (18), and (19). (For students tested three or more times, the two most recent sets of scores will be sufficient.) If you enter scores in columns (17), (18), and (19) for a student, please enter a 2 in column (16) for that same student to indicate that he took the ATGSB more than once.

(7) CES Index. Please ignore this column. It is to be used by ETS in processing the over-all series of studies.

(8) Additional Predictor. You may list any primary quantified variable (not exceeding 3 digits) you use in conjunction with ATGSB scores and undergraduate grades for admissions purposes. If you use no other quantified variable or do not wish to provide data for one, leave this column blank. If you do list data in column (8), please provide a description of the variable--its name, the possible range of its numerical scale, and an explanation of how it is used in the admissions process at your school.

(9) Undergraduate College Code. Please enter in this column the 4-digit code from the enclosed College Coding List. If you do not find the name of the college on the list, write the name of the college and the state or country where it is located in the "Remarks" column (20). Note that some foreign universities (e.g., London School of Economics, 0972) are listed individually; others will have to be coded 0900 (see p. 178, Miscellaneous Foreign and Territorial Dependencies). Also note that institutions whose names begin with "College of" or "University of" are alphabetized under "C" or "U" respectively.

(10) Age. Please record the student's age to the nearest year as of July 1 of the calendar year when he entered your school. If this information is not readily available to you, leave the column blank.

(11) Major Field Code. Please enter in column (11) the major field code corresponding to the student's undergraduate major field. Note that the major field code is printed on the ATGSB score report for each student (01 Humanities, 02 Science, 03 Social Science except Economics, 04 Economics, 05 Business and Commerce, 06 Engineering, and 07 Other).

(12) Drop-outs and Failures. In the column labeled "Drop-out," please provide information on the academic status of each student who has left the class, using the following symbols:

1 = Dismissed for academic reasons, or withdrew voluntarily in unsatisfactory academic standing.

2 = All other withdrawals.

The drop-out group should include students who completed the first year but will not or did not return for the second year, as well as students who did not complete the first year.

Note that those students dismissed for academic failure after completing

their final examinations are classified as withdrawals but have a first-year average to report as well.

(13, 14, 15) Special Codes. Columns (13), (14), and (15) are to be used to facilitate the identification of subgroups within a class. If all of the students on a page belong to the same subgroup, it is not necessary to write the code for every student; writing it once, for the first student listed on the page, would be sufficient. The columns should be used to indicate the following information:

(13) Number of Years Taken to Complete First Year (at least 24 semester hours, or the equivalent).

0 = Grade point average recorded in column (2) is based on less than 24 hours (i.e., first year not completed)

1 = First year (at least 24 hours) completed in one year, less than one year, or more than one year but less than two years

2 = First year completed in two years but less than three years

3 = First year completed in three years but less than four years

4 = First year completed in four years but less than five years

5 = First year completed in five or more years

(14) Full-time or Part-time

1 = Full-time student

2 = Part-time student

(15) Day or Evening

1 = Day

2 = Evening

Note: If you have no evening classes and this distinction is not applicable, you may leave the entire column blank.

(16, 17, 18, 19) Previous Scores - Repeaters Only. These columns are to be used only if you wish to enter more than one set of ATGSB scores for students who took the ATGSB more than once. (See (4), (5), and (6) above.) For each student who repeated the ATGSB, enter a 2 in column (16) to indicate that he is a repeater and record his previous scores in columns (17), (18), and (19). (His most recent scores should be recorded in columns (4), (5), and (6). For students tested three or more times, the two most recent sets of scores will be sufficient.) If you have many students who repeated the ATGSB, we would appreciate learning whether you use the most recent score, the earliest score, the highest score, an average, or some other combination in your admissions procedures.

(20) Remarks. To facilitate data gathering for a potential research project, please enter the following appropriate code in this column for each student.

U = Uninterrupted student, e.g., a student who entered graduate school one calendar year or less following completion of his undergraduate work. This category would include the student who graduated in January or February but did not matriculate in a graduate school until the following September, as well as the student who exhibits the usual pattern of a June graduation and September matriculation. A student who finishes undergraduate school in June but who waits until the following January or February to start graduate school should also be included in this category.

I = Interrupted student, e.g., a student who waited at least one calendar year before beginning graduate work.

This column is also to be used for names of uncoded undergraduate colleges. (See (9) above.) In addition, please use this column to designate students who are atypical in ways that may make it impossible to compare them with other students for purposes of this study. For example, students who did not complete a full undergraduate program before admission to business school and foreign students with a language handicap should be noted here.

Please address the completed rosters to

Mr. William K. Laidlaw, Jr.
Associate Program Director
Admission Test for Graduate Study in Business
Educational Testing Service
Princeton, New Jersey 08540

If you have any questions about what to record, please telephone Mr. Laidlaw or Miss Barbara Hillhouse at Educational Testing Service (Area Code 609, 921-9000, Extension 2909).

9-69

Appendix B

Copy of Sections I and III (Common)
Used in Individual School Validity
Study Reports, 1969-70

-I. 1-

Admission Test for Graduate Study in Business

Validity Study Service

One of the criteria of usefulness of the Admission Test for Graduate Study in Business is its ability to predict academic performance in graduate business school work. From the inception of the program in 1953 predictive effectiveness has been a consideration in the design of the test; and repeated validity studies* have confirmed that the ATGSB does improve prediction significantly over use of the undergraduate record alone.

Brief information about these studies and general guidelines concerning the use of test scores are contained in the ATGSB Handbook for Deans and Admission Officers. However to make full use of test scores each school needs detailed information about how its candidates perform on the test and how their scores relate to performance in its own particular curriculum as taught and graded by its own faculty. It is the purpose of the ATGSB Validity Study Service to provide this kind of information to each participating school. Thus each school will have a statistically sound basis for combining test scores and undergraduate record to obtain estimates of the academic promise of each applicant.

*The effectiveness of the ATGSB as a predictor of first-year business school grades was evaluated and the results of the studies were reported in: The Admission Test for Graduate Study in Business as a Predictor of First-Year Grades in Business School, 1954-1955, Marjorie Olsen, ETS Statistical Report 57-3, January, 1957; The Admission Test for Graduate Study in Business as a Predictor of First-Year Grades in Business School, 1958-1959, Barbara Pitcher, ETS Statistical Report 60-34, June, 1960; and The Admission Test for Graduate Study in Business as a Predictor of First-Year Grades in Business School, 1962-1963, Barbara Pitcher, ETS Statistical Report 65-21, April, 1965. The two most recent studies provided information on the usefulness of verbal and quantitative as well as total ATGSB scores as predictors of first-year average grades. An additional study, based on the data from the 1967-68 ATGSB Validity Study Service, was reported in ATGSB Research and Development Committee Brief Number Three. Moderator Variable Study: The Effect of Background Factors on the Prediction of Performance in Graduate Business School. ETS, July 1969.

Of course the final judgment of the applicant's promise must rest with the admissions official or committee. The statistical prediction is designed only to facilitate use of the scores.

Each Validity Study Service report consists of three sections organized so that the introductory and concluding sections are common to the reports for all participating business schools. The pages presenting the individual school's specific results are bound into the center of its report. The first section, preceding the school's own report, contains general information about the basi concepts of a validity study. The section following the school's own report contains information which should aid business school personnel in the interpretation of their own results.

-I. 3-

Basic Concepts Underlying Validity Studies

Over a period of many years, research workers in the testing field have developed a fairly uniform way of thinking about the design of validity studies and have adopted in most instances a standard set of statistical concepts and procedures for these studies. The methods used in the business school validity studies embody these well-established and widely accepted procedures.

The logic of validity studies requires that careful consideration be given to three basic issues. First, some measure of success must be identified. This measure should be acceptable to test users as a reasonable indicator of success. In validity study work, this measure is usually called the criterion. Business schools have generally considered that first-year average grades constitute an acceptable criterion. Second, appropriate predictive measures must be identified. Extensive experience, both in business schools and in other academic fields, has shown that previous academic record makes an important contribution to prediction over and above that obtained from test scores. Accordingly, the validity study design includes some measure of undergraduate record whenever possible. Finally, the group of students on which the study is to be based must be carefully defined. In particular, it is important that the group be fairly large so that the statistical results may be interpreted with confidence.

The relation between the predictive measures and the criterion is expressed in the form of a correlation coefficient, which is referred to in the validity study context as a validity coefficient.

Correlation Between Two Variables

Correlation is the tendency for two measures, such as height and weight, to vary together or be related for individuals in a group. If, as in the case with height and weight, one variable tends to go up as the other goes up, then the correlation is positive. On the other hand, months of practice and golf scores would have negative correlation, for ordinarily as the one variable increases the other tends to decrease. Correlation does not imply causation but only concomitance.

-I. 4-

The correlation coefficient is the customary index for expressing the degree of the relationship observed between two sets of measures for the same group. The coefficient can vary from -1.00, showing perfect negative correlation, through zero, indicating no correlation, to +1.00, showing perfect positive correlation.

If, for example, the correlation coefficient between height and weight for a group of men were +1.00, one could, knowing a man's height, predict his weight perfectly, that is, without error. Another way of saying this is that all the variation in the men's weight is accounted for by their variation in height. A correlation of +1.00 would strongly imply causation between the variables, though this would not be a certainty since the apparent relation between the variables being correlated might in actuality be caused by a third variable.

On the other hand if the correlation coefficient between height and weight were zero, one could not predict a man's weight any more accurately knowing his height than not knowing his height, and therefore the best guess as to his weight would be the average weight of all the men in the group.

Most correlation coefficients fall somewhere between zero and 1.00, which means that knowledge of an individual's score on one variable enables one to predict his standing on the other variable imperfectly but with greater accuracy than if the correlation were zero. The higher the coefficient, the less error there will be in making this prediction.

The degree of relationship between predictor and criterion represented by correlation coefficients of various sizes can be illustrated diagramatically. Table I shows the chances in 100 that a student who reaches a certain standing on a predictor having a designated validity will achieve various levels of success on graduate business school grades. For example, suppose that the correlation coefficient between ATGSB Total scores and grades in a graduate business school turns out to be .40. Knowing that correlation coefficient makes it possible to determine what chance each student may have to stand high or low in graduate business school--assuming that ATGSB Total scores alone are used to make predictions. Thus, a student whose ATGSB Total score puts him in the top fifth has 38 chances in 100 of achieving a rank in the top fifth in graduate business school. If you were to take a hypothetical

-I. 5-

Table I

Relation Between Standing on Predictor and Standing on Criterion for Various Values of the Correlation Coefficient

Correlation Coefficient	Standing on Predictor	Per Cent of Students Standing in Each Criterion Group		
		Bottom Fifth	Middle Three-Fifths	Top Fifth
.10	Top Fifth	16	60	24
	Middle Three-Fifths	20	60	20
	Bottom Fifth	24	60	16
.20	Top Fifth	13	59	28
	Middle Three-Fifths	20	60	20
	Bottom Fifth	28	59	13
.30	Top Fifth	10	57	33
	Middle Three-Fifths	19	62	19
	Bottom Fifth	33	57	10
.40	Top Fifth	7	55	38
	Middle Three-Fifths	18	64	18
	Bottom Fifth	38	55	7
.50	Top Fifth	4	52	44
	Middle Three-Fifths	17	66	17
	Bottom Fifth	44	52	4
.60	Top Fifth	2	48	50
	Middle Three-Fifths	16	68	16
	Bottom Fifth	50	48	2
.70	Top Fifth	1	43	56
	Middle Three-Fifths	14	72	14
	Bottom Fifth	56	43	1
.80	Top Fifth	0.2	35.4	64.4
	Middle Three-Fifths	11.8	76.4	11.8
	Bottom Fifth	64.4	35.4	0.2
.90	Top Fifth	(0.002)	25.2	74.8
	Middle Three-Fifths	8.4	83.2	8.4
	Bottom Fifth	74.8	25.2	(0.002)

group of 100 students, all with ATGSB Total scores in the top fifth of the graduate business school applicant group, 38 would keep that same standing in graduate business school. The rest would fall in rank, some of them dropping to the opposite end of the grading scale. Fifty-five students out of the sample of 100 would have a graduate business school standing in the middle three-fifths of their graduate business school class. Seven students would defy prediction by finishing in the bottom fifth, although like the others in the sample of 100, each had a better chance to finish in the top fifth.

In the case of a predictor with a validity of .50, the results of prediction are somewhat better. The figures in the lower left and upper right corners, which indicate conformity of prediction with result, are somewhat higher than for a correlation of .40. Fewer predictions are off by one or more categories on the criterion. However, it should be noticed that gross errors continue to occur. Four out of 100 students for whom top graduate business school performance is predicted will be at the bottom of the class and four out of 100 for whom poor performance is predicted will come through in the top group. There is a further increase in conformity between prediction and performance when the correlation coefficient goes up.

The table makes it clear that a predictor (scores and/or undergraduate grades) which is significantly correlated with a criterion measure (graduate business school grades) can be used to reduce the amount of error in the selection process--assuming that selection is aimed exclusively at insuring academic success, which may not always be true. However, another point which is evident in the tables and which needs the strongest emphasis is that prediction based on scores and undergraduate grades is far from perfect. There will be a great number of cases where prediction misses the mark by a moderate amount and a sizeable number where actual performance will be directly opposite from predicted performance. This should be a sobering lesson to anyone tempted to think that the test scores offer an easy and complete solution to his admissions problems. When he looks at an applicant with an unimpressive score he should remember the low-scoring students admitted in the past who performed near the top of the class. Even if the score before him falls below the scores of such students and if the chances of top performance are therefore slimmer, the student in question might possibly rank somewhere in the middle of the class if admitted--and, after all, no class can be

all top. The point here is one that has been made repeatedly before but which cannot receive too much emphasis: The scores must be used in the light of all the available information about applicants and there will be many occasions when the evidence of the scores should be discounted because it is overwhelmed by contrary evidence from other sources.

Correlation Between Criterion and Combinations of Predictors

In addition to investigating the usefulness of test scores and undergraduate grades as independent predictors of graduate business school performance, these validity studies are designed to determine that combination of test scores and other predictors which will give the best over-all estimate of success in graduate business school as measured by first-year average grades.

The multiple correlation coefficient, which is used to evaluate combinations of predictors, can be thought of in much the same way as the correlation coefficient between a single predictor and a criterion, except that the several measures used as predictors must first be combined into a working team, where each member of the team is given an appropriate weight. The determination of these weights is done mathematically so that each predictor is given its optimal weight for the prediction of the criterion performance for a particular group of students.

Regression Equations

Although correlation coefficients tell how well a particular predictor is working, they do not in themselves provide a specific prediction for a particular individual. For this purpose, a regression equation is needed. Figure 1 illustrates the idea of a regression equation. Each dot on the graph may be considered to represent the test score and first-year average grade of one student. Examination of the pattern of dots shows that there is a general upward trend. It is possible to determine mathematically the equation of the straight line which best describes this trend; the resulting equation is called the regression equation. The straight line in Figure 1 is the line determined by the regression equation for the data plotted in the graph.

-I. 8-

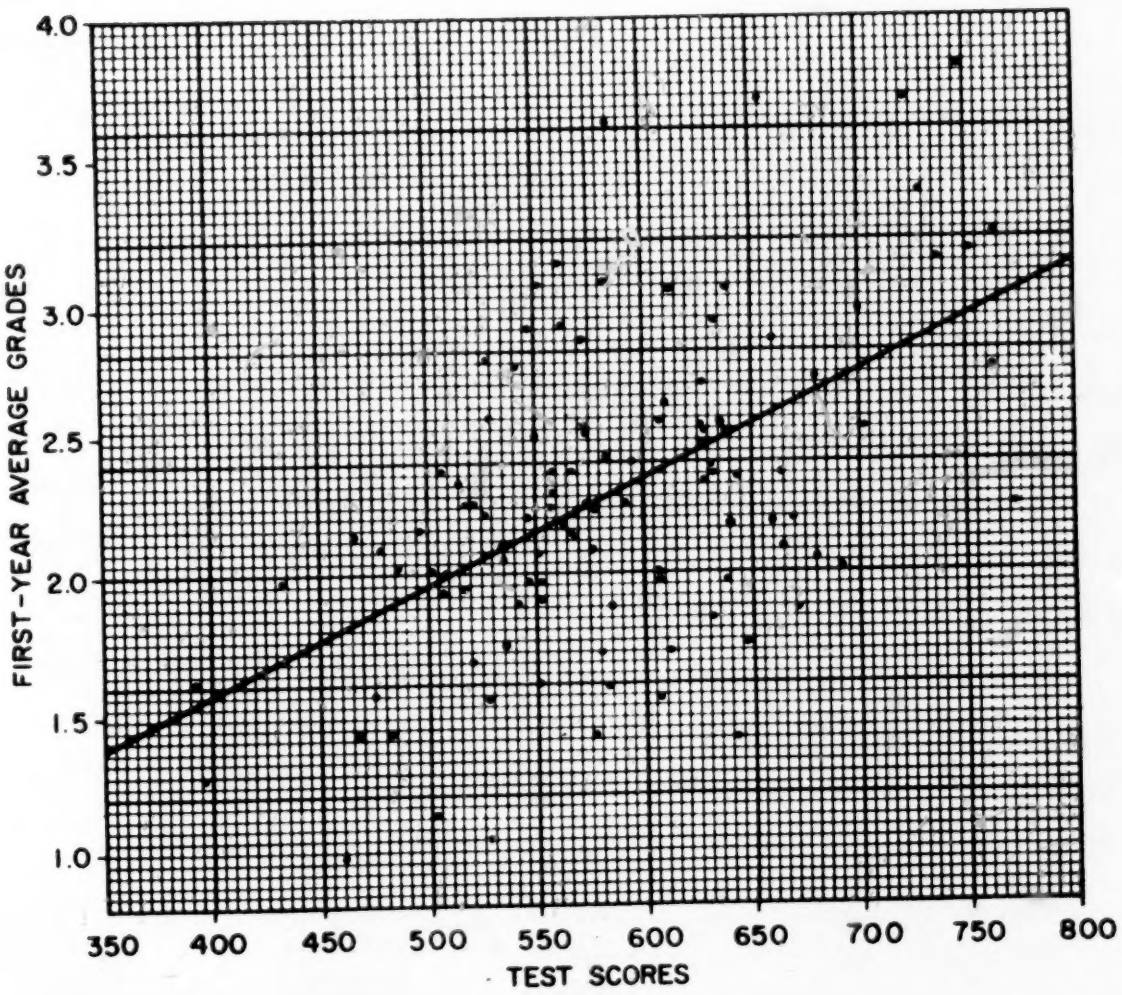

FIGURE 1. How the line of relation summarizes the main trend of the relationship between test scores and grades. (Each dot represents one student.)

The correlation coefficient for these data is about .50.

-III. 1-

Using the Results

Included in the pages of results for each graduate business school are the following kinds of information: a brief summary of the results for that school, a prediction table which can be used to estimate predicted graduate business school grades for new applicants to that school, and an expectancy table to be used along with the prediction table.

Each prediction table has been prepared by using the regression equation resulting from the study carried out for that school. An example of such an equation follows:

$$\text{Predicted FYA} = .003\ (\text{ATGSB Total}) + .109\ (\text{UGR}) - .325$$

This particular equation was derived from fictitious data for a school which used a rather unusual arbitrary scale for assigning numerical values to the undergraduate records of its applicants. According to the scale used at this school, A = 18, A- = 17, B+ = 16, and so on, down to D+ = 10. The grading scale used for first-year averages is a four-point scale where A = 4 and D = 1.

The following example shows how this school might use its regression equation and the tables resulting from it. Suppose that undergraduate records and ATGSB Total scores have been received in the admissions office for the following fifteen applicants (their names are fictitious, of course):

	ATGSB Total Score	Undergraduate Record	Numerical Value UGR
Adams, Frank	300	A-	17
Black, Robert	600	C+	13
Brown, John	525	A-	17
Coe, Gordon	700	B	15
Doe, John	750	A	18
Evans, Richard	660	C+	13
Green, George	600	B+	16
Hill, Joseph	400	C	12
Johnson, Donald	475	B-	14
Jones, Thomas	690	A-	17
Poe, Peter	650	C+	13
Roe, Walter	775	B+	16
Smith, James	750	C+	13
White, William	425	B+	16
Wood, Ralph	500	D+	10

-III. 2-

If the school has high-speed electronic data processing equipment, it is a simple matter to compute the predicted first-year average for each applicant from the equation. To do it by hand would be more tedious. For example, Frank Adams' predicted average would be:

.003	.109	1.853
x 300	x 17	+ .900
.900	763	2.753
	109	- .325
	1.853	2.428

The provision of a prediction table such as Table A on the next page means that such computations have to be done only once, and then it is a simple procedure to look up in the table the predicted grade for each applicant. For example, to predict Frank Adams' first-year average grade at this school by means of the table, locate his ATGSB Total score, 300, on the ATGSB Total score scale at the top of the table. Then read down the column to the row opposite 17 on the vertical scale for undergraduate average. The result, according to Table A, is 2.4, the same value, rounded to one decimal place, that was obtained above from the use of the equation. Similarly, Robert Black's predicted grade would be 2.9. John Brown's grade would be slightly more difficult to estimate because his ATGSB Total score of 525 does not appear in the table. Since 525 is halfway between the ATGSB Total scores of 500 and 550, which do appear in the table, one could look up the prediction for each of two combinations, ATGSB Total 500 and UGR 17, and ATGSB Total 550 and UGR 17. According to the table these two values are 3.0 and 3.2, respectively. The average value, or the value halfway between these two, is 3.1, the same predicted grade that would result from the use of the equation. (Finer distinctions can be made by interpolating between the tabled values--for example, for a score of 539 and an undergraduate average of 15.2--but it is doubtful that such fine distinctions would be justified. Reading the nearest tabled values or finding the value halfway between the tabled values should be sufficient.)

-III. 3-

Table A

Predicted First-Year Average Grades at a Fictitious School for Students with Various Undergraduate Records Who Earn Various ATGSB Total Scores

Undergraduate Record		Predicted first-year average grade for student whose test score is:												
		200	250	300	350	400	450	500	550	600	650	700	750	800
A	18	2.2	2.4	2.5	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.7	3.9	4.0
A-	17	2.1	2.3	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	3.9
B+	16	2.0	2.2	2.3	2.5	2.6	2.8	2.9	3.1	3.2	3.4	3.5	3.7	3.8
B	15	1.9	2.1	2.2	2.4	2.5	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.7
B-	14	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.5	3.6
C+	13	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.5
C	12	1.6	1.7	1.9	2.0	2.2	2.3	2.5	2.6	2.8	2.9	3.1	3.2	3.4
C-	11	1.5	1.6	1.8	1.9	2.1	2.2	2.4	2.5	2.7	2.8	3.0	3.1	3.3
D+	10	1.4	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	3.0	3.2

A prediction obtained in this manner, using Table A or the regression equation from which Table A was prepared, gives the applicant's most probable average grade. Of course, not all students with the same predicted grade will actually earn the same average grade. Table B, an expectancy table, may be used to determine the chances in 100 that an entrant will earn a first-year average grade equal to or higher than any selected average grade. For instance, suppose you wished to determine the chances in 100 that Frank Adams will earn a first-year average grade of 3.0 or better at the school in the example. Find his predicted grade of 2.4 in the left-hand column of Table B on the next page. Follow a horizontal line across the table until you reach the column headed 3.0. The table then shows that Robert Black has 5 chances in 100 of earning an average grade of 3.0 or better. Similarly, the chances of his earning various other selected average grades may be read from Table B. For example, he would have 98 chances in 100 of earning an average grade of 1.6 or better.

Having predicted averages for the fifteen applicants in the illustration, one could then rank them according to their predicted averages and look

up the chances in 100, from Table B, that each applicant has of making a grade of 2.8 or higher (2.8 is the "passing" grade at this school). The results would be as follows:

Applicant	Predicted Grade	Chances in 100 of Earning a Grade of 2.8 or Higher
John Doe	3.9	99+
Walter Roe	3.7	about 98
Thomas Jones	3.6	98
Gordon Coe	3.4	95
James Smith	3.3	about 90
George Green	3.2	86
John Brown	3.1	about 78
Richard Evans	3.1	about 78
Peter Poe	3.0	70
Robert Black	2.9	about 60
William White	2.7	about 40
Donald Johnson	2.6	30
Frank Adams	2.4	14
Ralph Wood	2.3	about 9
Joseph Hill	2.2	5

Table B

Chances in 100 That Students with Various Predicted Grades (Based on Table A) Will Equal or Excel Various First-Year Average Grades

Predicted Grade	Chances in 100 That a Student Will Earn an Average of at Least:													
	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
4.0									99	98	95	86	.70	50
3.8								99	98	95	86	70	50	30
3.6							99	98	95	86	70	50	30	14
3.4						99	98	95	86	70	50	30	14	5
3.2					99	98	95	86	70	50	30	14	5	2
3.0				99	98	95	86	70	50	30	14	5	2	1
2.8			99	98	95	86	70	50	30	14	5	2	1	
2.6		99	98	95	86	70	50	30	14	5	2	1		
2.4	99	98	95	86	70	50	30	14	5	2	1			
2.2	98	95	86	70	50	30	14	5	2	1				
2.0	95	86	70	50	30	14	5	2	1					
1.8	86	70	50	30	14	5	2	1						
1.6	70	50	30	14	5	2	1							
1.4	50	30	14	5	2	1								

-III. 5-

It is apparent that the predicted average grade serves to define a range of grades within which each student's performance is likely to fall rather than to pinpoint the exact average grade that a student will make. This fact emphasizes the importance of using these predictions in the light of other evidence about the applicant in arriving at a final evaluation of his prospects of academic success.

Additional Factors in Interpreting Results

Because of its inherent errors of measurement and because of other factors which a test could not be expected to measure, no test, no matter how carefully constructed, can ever be expected to sort out with complete accuracy the students who will pass or fail. Thus, one should not expect to find a predictive validity coefficient of 1.00, or even of .70. This section presents additional information which should aid the individual graduate school of business in interpreting the correlational results based on its own students' records.

Comparison with Results in Other Schools

When validity studies are conducted in the same manner in a number of schools, a school can compare its results with those obtained in other schools. Figure 2, on the following page, has been prepared to facilitate such comparisons. In Figure 2, each dot represents the validity of a particular predictor or combination of predictors in one of 52 graduate schools of business. The figure summarizes results for studies done in 1967-68 and 1968-69.

The median values based on all 52 studies are useful in judging the typical level of validity obtained. The median value for the prediction of first-year average grade in graduate schools of business from undergraduate record alone is .25. The median value for the prediction of the same criterion from ATGSB Total alone is .24. Combining the two predictors, undergraduate record and ATGSB Total scores, results in a higher validity for predicting first-year grades in graduate business school, with a median of .37.

Using Figure 2, a school may readily determine whether its own validity coefficients are unusually high, unusually low, or near the average for the 52 schools participating in the 1967-68 and 1968-69 validity studies. Differences in validity coefficients from one graduate school to another may be due to a variety of factors. Two of the most important of these -- sampling fluctuation and the effects of selection -- are discussed in the following pages.

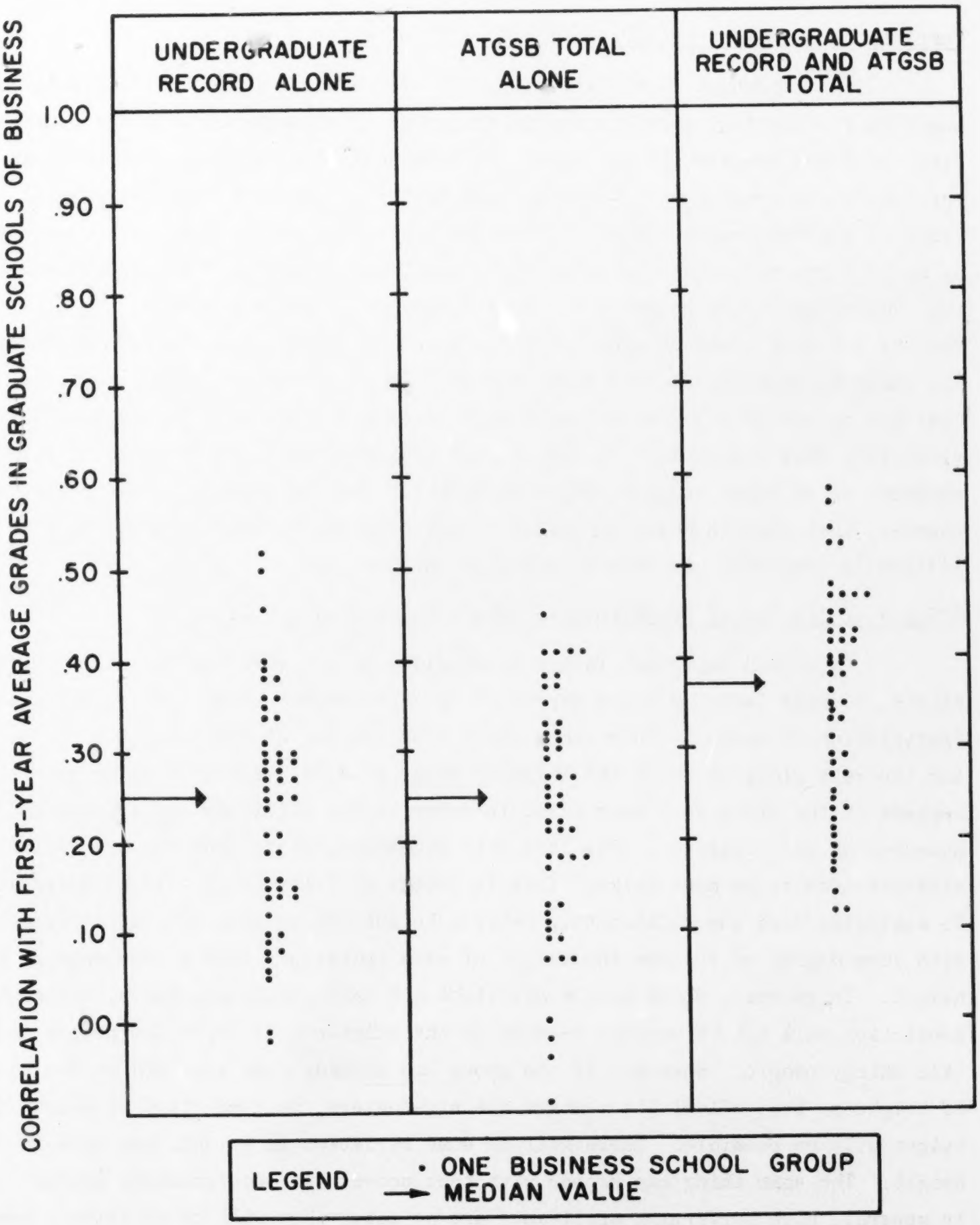

FIGURE 2. Validity coefficients for undergraduate record alone, ATGSB Total alone, and undergraduate record and ATGSB Total combined. (Based on studies conducted in 1967-68 and 1968-69 for 52 graduate schools of business.)

-III. 7-

Sampling Fluctuations in Correlation Coefficients

An important factor affecting the size of correlation coefficients is sampling fluctuation, particularly if the group of students on whom the coefficient is based numbers 100 or fewer. An especially discouraging result--or an especially encouraging one, too, for that matter--based on a relatively small group of students might not be encountered again if another study were conducted on another group of students selected, taught, and graded by what appear to be the same methods. In order to combat sampling fluctuation somewhat, the plan for the Validity Study Service calls for a school to furnish data for two entering classes, each with 100 or more students. Many of the graduate schools of business do not have 100 students in each class and therefore, from a practical viewpoint, this requirement of two classes of 100 students each has to be relaxed somewhat if validity studies are to be done for smaller schools. The fact remains, however, that results based on larger groups of students will be more stable statistically than will the results based on smaller groups.

Effects of the Use of Predictors in Selection on Their Validity

A second important factor to consider in interpreting validity coefficients is their tendency to be depressed by a phenomenon known statistically as "restriction of range." This comes about from the use of the predictor in selecting the very group on which the validity study is done, thus tending to make the members of the group very much alike in terms of the abilities and achievement measured by the predictor. The less able students are excluded and the admitted students tend to be more alike. This in itself will result in a lower correlation. To analogize from the relationship between height and weight, one could predict with some degree of success the weight of each individual from a knowledge of his height. In general, short people are light and tall people are heavy, although prediction will not be perfect because of the existence of short fat people and tall skinny people. However, if the group has already been selected on the basis of height so that all of its members are six-footers, no prediction of weight from height will be possible. There will be some variation in weight, but none in height. The same thing can happen with test scores and undergraduate grades. If, in general, high performing applicants are selected they will be relatively homogeneous in terms of scores and grades and the accuracy of prediction will be undercut for the admitted groups. In a sense, part of the validity of the test or grades has been "used up" in the admission process.

-III. 8-

It is clear from the foregoing discussion that the ideal way to do a validity study, from a statistical point of view, would be to use data that had not been subjected to the winnowing processes of selection. This, of course, is not possible in the practical operations of the Admission Test for Graduate Study in Business School program. An awareness of these problems should help the practicing admissions officer to see that the more stringently he uses the predictors for selection the lower the validity of those predictors with the criterion in which he is interested will appear to be.

As selection becomes more intensive another factor may come into play which will tend to reduce the validity of predictors. When more than one predictor is being used, it is natural in many situations to let excellence on one compensate for deficiency in the other. Thus an applicant with a relatively low test score may be admitted because of a distinguished college record or vice-versa. The effect of this practice is to admit those for whom the prognosis in terms of one of the predictors is relatively untrustworthy. In the case of the applicant with the low score and high college record, he may have had a bad day at the testing session and his college record may provide a sounder basis of appraisal. If he is admitted and does well, the test score will appear invalid. Conversely, if the applicant has a high score and a mediocre college record, it may be because he was bored at college. If he is admitted and does well, the college record will appear invalid.

It is an interesting fact that although selection has a decidedly adverse effect on validity coefficients, there is excellent reason to believe that its effects on regression equations of the type given in this report is relatively small. Thus, the regression equation may be used with considerable confidence in estimating the academic promise (or lack thereof) of applicants whose records are below the existing standards for admission to a graduate school of business. Essentially, this procedure involves extending the trend line based on admitted students. Fortunately, then, graduate business schools which make extensive use of test scores and undergraduate grades in selection may use the prediction equations with considerable confidence even if the validity coefficients are relatively low.

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Table C

Correlations of Predictors with First-Year Business School Average Grades

for 52 Graduate Schools of Business Participating in 1967-68 and 1968-69 Validity Study Service

Business School Group	Correlation of First-Year Average Grades with:								
	Undergraduate Record (U)	ATGSB Total (T)	ATGSB Verbal (V)	ATGSB Quant. (Q)	CES Index (C)	Combination of: U,T	U,V,Q	U,T,C	U,V,Q,C
Studies based on full-time day students									
A	.25	.24	.03	.40	.29	.38	.51	.47	.57
B	.14	.11	-.04	.22	.20	.11	.20	.21	.25
C	.08	.38	.27	.39	.43	.38	.39	.49	.49
D	.05	.22	.07	.27	.20	.19	.24	.26	.29
E	.29	.35	.20	.40	.27	.43	.47	.49	.52
F	.19	.31	.15	.35	.26	.33	.38	.37	.42
G	.06	.33	.22	.33	.32	.35	.36	.42	.43
H	.30	.30	.12	.39	.16	.44	.51	.44	.51
I	.30	.32	.18	.36	.17	.42	.45	.45	.48
J	.27	.27	.24	.16	.22	.35	.34	.41	.41
K	.50	.37	.18	.41	.07	.57	.62	.58	.62
L	.34	.09	.04	.12	.17	.32	.32	.37	.36
M	.35	.41	.27	.38	.26	.52	.53	.55	.55
N	.40	.07	.11	-.0004	.08	.39	.39	.40	.41
O	.28	.41	.27	.40	.27	.45	.46	.46	.47
P	.46	.21	.10	.22	.08	.51	.51	.52	.52
Q	.27	.21	.15	.20	.07	.34	.34	.34	.34
R	-.01	.54	.45	.44	.23	.52	.52	.53	.52
S	.14	.45	.39	.37	.27	.47	.45	.48	.47
T	.24	.27	.13	.28	.02	.37	.37	.36	.37
U	.25	.12	.05	.14	-.003	.27	.26	.26	.25
V	.52	.37	.22	.35	.14	.56	.55	.55	.54
W	.28	-.02	.01	-.04	-.01	.24	.22	.24	.21
Median	.27	.30	.15	.35	.20	.38	.39	.44	.47
Studies based on evening students (6 studies) or on mixed groups of full-time and part-time, day and evening students, or day students with differing types of programs									
X	.39	.29	.23	.27	.26	.46	.46	.57	.57
Y	.09	.27	.26	.21	.33	.26	.25	.36	.37
Z	.12	-.04	-.05	-.02	.13	.03	*	.16	.14
AA	.25	.10	.24	-.05	.12	.23	.31	.23	.31
BB	-.02	.18	.05	.27	.15	.12	.22	.08	.20
CC	.15	.18	.20	.10	.26	.16	.14	.24	.23
DD	.16	-.002	.01	-.004	.14	.09	.03	.18	.16
EE	.15	.13	.11	.16	.17	.16	.18	.21	.22
FF	.29	.38	.28	.38	.39	.42	.43	.48	.48
GG	.21	.07	.02	.11	.11	.18	.19	.22	.24
HH	.38	.25	.35	.05	.16	.40	.45	.40	.45
II	.16	.32	.24	.28	.27	.30	.28	.36	.34
JJ	.31	.33	.27	.32	.34	.46	.46	.50	.50
KK	.15	.41	.40	.34	.40	.42	.42	.46	.46
LL	.21	.13	.15	.07	.16	.23	.23	.27	.27
MM	.14	.18	.16	.13	.15	.17	.13	.22	.20
NN	.36	.24	.28	.14	.20	.40	.41	.42	.43
OO	.26	.07	.08	.04	.13	.25	.24	.29	.28
PP	.36	.30	.27	.23	.23	.43	.43	.46	.45
QQ	.27	.41	.40	.30	.27	.46	.46	.48	.48
RR	.19	.26	.14	.26	.10	.29	.30	.30	.31
SS	.38	.25	.15	.24	.15	.43	.44	.43	.44
TT	.30	.31	.30	.23	.15	.37	.36	.37	.37
UU	.07	.17	.15	.12	.17	.16	.12	.18	.15
VV	.10	.21	.16	.20	.17	.20	.18	.21	.19
WW	.34	.18	.10	.16	.09	.37	.34	.35	.33
XX	.29	.22	.19	.18	.02	.29	.28	.27	.25
YY	.08	.09	.06	.09	.07	*	*	*	*
ZZ	.10	-.09	.03	-.18	-.04	*	.12	*	.05
Median	.21	.21	.16	.16	.15	.26	.28	.29	.31
Median of 52 Groups	.25	.24	.16	.22	.17	.35	.35	.37	.37

Within each of the two groups (day vs. evening or mixed) the business school groups are listed in order according to the increase in predictive effectiveness obtained by using the combination of undergraduate record, ATGSB Verbal and Quantitative scores, and CES Index compared with using undergraduate record and ATGSB Total. The correlation coefficients shown for combinations of predictors are multiple correlations corrected for "shrinkage."

*"Shrunken" value is indeterminate because the "Shrinkage" formula does not yield a definite

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Usefulness of Part Scores and CES Index for Prediction

The 1967-68 and 1968-69 validity studies included an evaluation of two possible ways of improving prediction. One approach used Verbal and Quantitative part scores rather than Total scores in combination with undergraduate grades for predicting graduate business school grades. A second approach used data from the ATGSB Statistical Summary by Undergraduate Colleges Attended, 1957-65. The average ATGSB Total scores earned by all candidates from a student's college in 1957 to 1965 was used as an additional predictor. (If his undergraduate college was not listed, his own ATGSB Total score was used for this predictor.) This predictor was named Candidate Excellence by School, or briefly, the CES Index. The purpose of this approach was to find out whether a rough indication of the quality of a student's undergraduate college would help to predict his graduate business school grades. In comparing possible combinations of predictors, validity coefficients were adjusted statistically to allow for the number of predictors in each combination.

Table C shows the validity coefficients for each predictor separately and the "shrunken" validity coefficients for four combinations of predictors. Results have been arranged so that those based on full-time day students have been grouped and those based on evening students or on a combination of day and evening or of full-time and part-time students are also grouped. Schools are arranged within a group according to the amount by which the four-predictor validity coefficient exceeds the two-predictor coefficient.

In 25 of the 52 schools, a gain in prediction of .05 or greater could be achieved by using a three- or four-predictor equation for calculating predicted grades. In seven of these schools, the four-predictor equation seems preferable; in 18 schools, the appropriate three-predictor equation should be adequate. The decision to use more than two predictors should, of course, take account of the additional work required. Moreover, some schools may hesitate to use CES Index as a regular part of their prediction system because they are skeptical of its accuracy for some colleges. The results do clearly indicate, however, that some graduate business schools should give serious consideration to the use of part scores and/or CES Index as a way of obtaining more effective prediction.

Barbara Pitcher
William K. Laidlaw
William B. Schrader

Herman F. Smith
John A. Winterbottom

Appendix C

Results of Exploratory Cluster Analysis
Based on 23 Characteristics
and
Detailed Information about Six Groups
Used for Summarizing Validity Study Results

List of 23 Characteristics Used for
Classifying Graduate Schools of Business

†1. Day, Evening, Mixed

†2. Full-Time, Part-Time, Mixed

†3. First-Year Average Based on 24 Hours Completed in One Year, or Not

*4. Number of Students in Group Used for Validity Study

†5. ATGSB Total Mean

†6. ATGSB Total Standard Deviation

†7. ATGSB Verbal Mean

†8. ATGSB Verbal Standard Deviation

†9. ATGSB Quantitative Mean

†10. ATGSB Quantitative Standard Deviation

†11. CES Index Mean

†12. CES Index Standard Deviation

*13. Correlation of UGR with CES Index

*14. Correlation of UGR with ATGSB Total

15. Correlation of UGR with ATGSB Verbal

*16. Correlation of UGR with ATGSB Quantitative

†17. Per Cent of Validity Study Group Who Majored in Business as Undergraduates

†18. Per Cent of Validity Study Group Who Majored in Economics as Undergraduates

†19. Per Cent of Validity Study Group Who Majored in Engineering as Undergraduates

*20. Public, Private

†21. Number of MBA Degrees Granted in 1967-68 (from Delta Sigma Pi Twenty-First Biennial Survey of Universities offering an organized curriculum in Commerce and Business Administration)

†22. Type of Grading Scale Used for First-Year Average

†23. Type of Grading Scale Used for Undergraduate Record

*Five variables used for six clusters

†Seventeen variables used for four clusters

Arrangement of 69 Graduate Business School Groups
in Six Clusters on 5 Characteristics (Columns) and
Four Clusters on 17 Characteristics (Rows)

American Boston U.-Eve. U. of Bridgeport U. of Denver Long Island U. of Miami Oklahoma City Roosevelt U. of San Francisco Texas Christian	Bowling Green U. of Kansas	U. of Colorado U. of Detroit George Washington Kent State Pace St. John's San Diego State U. of Tennessee U. of Washington	Hofstra U. of Rochester Tulane	Fullerton State (Calif.) U. of Montana North Texas State	U. of Arizona U. of Hawaii U. of Houston U. of Iowa Ohio Ohio State U. of South Carolina Western Michigan U. of Wyoming
Carnegie-Mellon London		MIT Northwestern Purdue U. of Virginia			U. of Michigan - Eve. U. of North Carolina
	UCLA U. of Michigan - Day	U. of Chicago Columbia Cornell Dartmouth NYU U. of Pennsylvania U. of Pittsburgh	Stanford		U. of California - Berkeley
Brigham Young Emory Syracuse	U. of Alabama Michigan State Penn State Rutgers	Boston U. - Day McGill U. of Southern California	Washington (Mo.)	U. of Toronto	Indiana U. of Missouri

Summary Description of Six Groups of Graduate Schools of Business Used for Summarizing Validity Study Results

Group	Number of School Groups	1	N 2	ATGSB Means 3	4	5	6	AGTSB S.D.s 7	8	9	10	Correlations 11	12	13	14	Majors 15	16	17	N 18
I	15	Max.	885	608	36.2	38.2	525	84	8.0	7.0	56	.16	.18	.13	-.03	44	41	80	502
		Mdn.	209	555	32.4	33.9	505	70	6.1	6.3	41	-.04	.00	-.03	-.19	23	25	20	164
		Min.	135	520	30.6	30.7	485	59	5.5	4.9	25	-.24	-.20	-.18	-.45	2	0	6	0
II	6	Max.	106	629	36.1	41.4	578	79	6.5	7.1	54	.08	.09	.05	.03	68	24	51	225
		Mdn.	96	550	32.6	33.4	501	62	6.0	5.3	38	-.08	-.06	-.08	-.10	28	15	21	48
		Min.	83	523	31.3	31.0	484	46	4.9	4.5	27	-.20	-.13	-.21	-.42	10	7	6	0
III	11	Max.	178	518	30.4	31.8	501	93	7.8	7.4	58	.29	.20	.26	.13	70	44	46	422
		Mdn.	108	503	28.8	30.0	482	72	6.4	6.3	36	.04	.11	.01	-.15	33	14	8	63
		Min.	84	479	25.2	27.0	469	58	5.7	5.2	26	-.14	-.23	-.10	-.31	5	5	1	20
IV	13	Max.	206	618	36.5	39.6	552	85	7.5	7.0	51	.39	.32	.41	.21	60	17	46	163
		Mdn.	109	536	31.5	32.9	500	70	6.1	6.1	36	.01	.04	-.02	-.20	46	6	25	53
		Min.	81	523	30.6	31.5	477	56	5.1	5.4	28	-.15	-.07	-.17	-.28	0	0	0	0
V	8	Max.	179	517	30.2	31.0	480	88	7.5	7.1	51	.21	.20	.16	.08	78	22	31	206
		Mdn.	144	479	28.0	28.4	470	78	6.8	6.6	37	.00	.06	.00	-.14	52	7	8	55
		Min.	111	445	25.7	24.9	441	70	6.3	6.0	28	-.33	-.17	-.37	-.21	32	4	0	7
VI	16	Max.	103	510	30.3	31.5	484	97	9.2	7.9	61	.24	.29	.23	.12	90	12	33	174
		Mdn.	99	478	27.8	28.2	473	77	6.8	6.6	36	.06	.09	.03	-.15	62	5	10	44
		Min.	83	459	26.0	26.3	450	67	5.9	5.8	21	-.12	-.12	-.18	-.34	33	0	1	0
Total	69	Max.	885	629	36.5	41.4	578	97	9.2	7.9	61	.39	.32	.41	.21	90	44	80	502
		Mdn.	109	518	30.4	31.0	485	73	6.5	6.3	37	.02	.04	-.01	-.17	43	10	16	63
		Min.	81	445	25.2	24.9	441	46	4.9	4.5	21	-.33	-.23	-.37	-.45	0	0	0	0

1. Maximum, Median, Minimum.

2. Number of Students

ATGSB Means

3. Total
4. Verbal
5. Quant.
6. CES Index

ATGSB Standard Deviations

7. Total
8. Verbal
9. Quant.
10. CES Index

Correlations of UGR with:

11. Total
12. Verbal
13. Quant.
14. CES Index

Per Cent Majoring as Undergraduates in:

15. Business
16. Economics
17. Engineering

18. Number of MBAs

Appendix D

Graduate Schools of Business with at Least One
ETS Validity Study Since the Beginning
of the ATGSB Program in 1954

Graduate Schools of Business with at Least One ETS
Validity Study Since the Beginning of the ATGSB Program in 1954

*Alfred P. Sloan School of Management of Massachusetts Institute of Technology (Code 3514)
American University School of Business Administration (Code 5007)
Boston University College of Business Administration (Code 3087)
Bowling Green State University College of Business Administration (Code 1069)
Brigham Young University College of Business (Code 4019)
*Carnegie-Mellon University Graduate School of Industrial Administration (Code 2074)
*Columbia University Graduate School of Business (Code 2093)
*Cornell Graduate School of Business and Public Administration (Code 2098)
*Dartmouth College Amos Tuck School of Business Administration (Code 3351)
*Emory University Graduate School of Business Administration (Code 5187)
Fullerton State College School of Business Administration and Economics (Code 4589)
George Washington University School of Government and Business Administration (Code 5246)
*Harvard University Graduate School of Business Administration (Code 3434)
Hofstra University School of Business (Code 2295)
*Indiana University Graduate School of Business (Code 1324)
Kent State University College of Business Administration (Code 1367)
London Graduate School of Business Studies (Code 0898)
Long Island University Arthur T. Roth Graduate School of Business Administration (Merriweather Campus) (Code 2070)
McGill University Graduate School of Business (Code 0935)
*Michigan State University Graduate School of Business Administration (Code 1465)
New York University Graduate School of Business Administration (Code 2562)
North Texas State University School of Business Administration (Code 6481)
*Northwestern University Graduate School of Business Administration (Code 1565)
Ohio State University College of Administrative Science (Code 1592)
Ohio University College of Business Administration (Code 1593)
Oklahoma City University School of Business (Code 6543)
Pace College Graduate School of Business Administration (Code 2635)
Pennsylvania State University College of Business Administration (Code 2660)
Purdue University, Herman C. Drannert Graduate School of Industrial Administration (Code 1631)
Roosevelt University College of Business Administration (Code 1666)
*Rutgers Graduate School of Business Administration (Code 2512)
San Diego State College Department of Graduate Study in Business (Code 4682)
*Seton Hall University School of Business Administration (Code 2811)
*Stanford University Graduate School of Business (Code 4704)
St. John's University, College of Business Administration--Graduate Division (Code 2799)
*Syracuse University College of Business Administration (Code 2823)
Texas Christian University, M. J. Neeley School of Business (Code 6820)
Tulane University Graduate School of Business Administration (Code 6832)
University of Alabama School of Commerce and Business Administration (Code 1830)
University of Arizona College of Business and Public Administration (Code 4832)
University of Bridgeport Graduate School of Business Administration (Code 3914)
University of California Graduate School of Business Administration (Berkeley Campus) (Code 4833)
University of California Graduate School of Business Administration (Los Angeles Campus) (Code 4837)

*University of Chicago Graduate School of Business (Code 1832)
University of Colorado Graduate School of Business Administration (Code 4841)
University of Denver College of Business Administration (Code 4842)
University of Detroit Graduate School (Code 1835)
University of Hawaii College of Business Administration (Code 0968)
University of Houston College of Business Administration (Code 6870)
University of Iowa College of Business Administration (Code 6681)
University of Kansas School of Business (Code 6871)
University of Miami Graduate School (Code 5815)
*University of Michigan Graduate School of Business Administration (Code 1839)
University of Missouri (Columbia) School of Business and Public Administration (Code 6875)
University of Montana School of Business Administration (Code 4489)
University of North Carolina Graduate School of Business Administration (Code 5816)
*University of Pennsylvania Wharton School of Finance and Commerce (Code 2926)
*University of Pittsburgh Graduate School of Business (Code 2927)
University of Rochester College of Business Administration (Code 2928)
University of San Francisco College of Business Administration (Code 4850)
University of South Carolina College of Business Administration (Code 5818)
University of Southern California Graduate School of Business Administration (Code 4852-1)
University of Tennessee College of Business Administration (Code 1843)
University of Toronto School of Business (Code 0982)
*University of Virginia Graduate School of Business Administration (Code 5820)
University of Washington Graduate School of Business Administration (Code 4854)
University of Wyoming College of Commerce and Industry (Code 4855)
*Washington University (Missouri) Graduate School of Business Administration (Code 6929)
Western Michigan University School of Business (Code 1902)

*Indicates a graduate school of business included in the Historical Summary, Table 6.